# USR-WIFI232-A/B/C

# Embedded WiFi Module User Manual

Version：V4.5

**Remarks:** This module is applicable to USR-WIFI232-A/B/C and its derivatives, for example USR-WIFI232-2/610. For USR-WIFI232-G/T/S, please refer to the corresponding document.

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# 1 Quick Start

USR-WIFI232 series product is used to transmit data between RS232 and WIFI TCPIP transparently, user can update the product to WIFI control without knowing the WIFI and TCPIP detail. All the convert work is done by the module. For users, the RS232 side is only as a serial device,the WIFI side is TCPIP Socket data. User can setup the work detail by sample settings which can setup via inside web pages or RS232 port. The setup work only need do once, then it will save the setting forever.

This chapter is a user guide for USR-WIFI232 series products. We suggest users follow the guide to test module at first, and will have a good understanding of the modules. Users can also choose the chapter which you are interested in to read. For specific details and instructions, please refer to the following chapters.

## 1.1 Hardware connect

In order to test WIFI module, we need connect module RS232 to PC and also WIFI to PC.

In order to test the communication between serial and WIFI network, we need to connect the serial port to PC, and also connect WIFI networks to PC. Due to the special need both WIFI and serial, we use PC which add USB WIFI network Card such as the following picture.

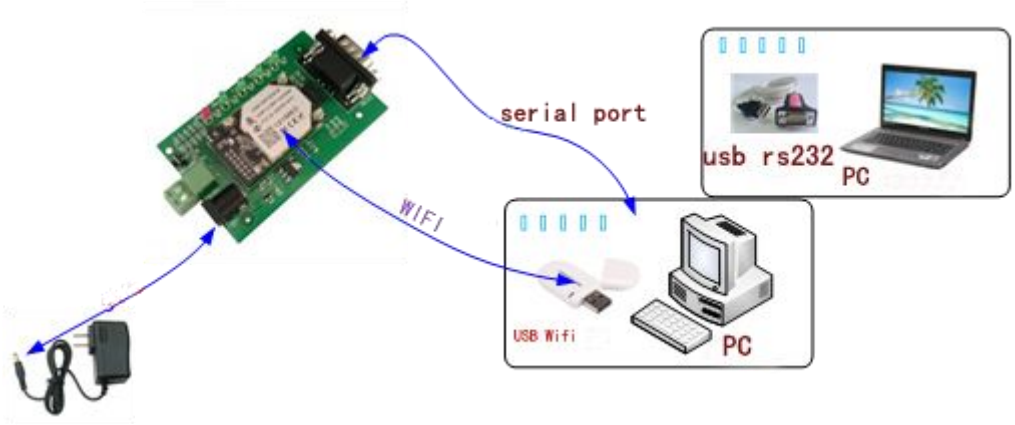



Figure 1 **hardware connection diagram**

About the serial connection, because the module RS232 is 3.3V TTL level, the computer can not connect to module directly, the user needs to have a TTL to RS232 adapter cable and then connect to the computer. in order to facilitate the test, we provide USR-WIFI232-A/B/C evaluation board for users to choose.

## 1.2 Network connection

The following is the USR-WIFI232-A module example,Other modules are the same.Open Wi-Fi, search network, as shown in below, USR-WIFI232-AP_3378 is the default network name (SSID) of the module.

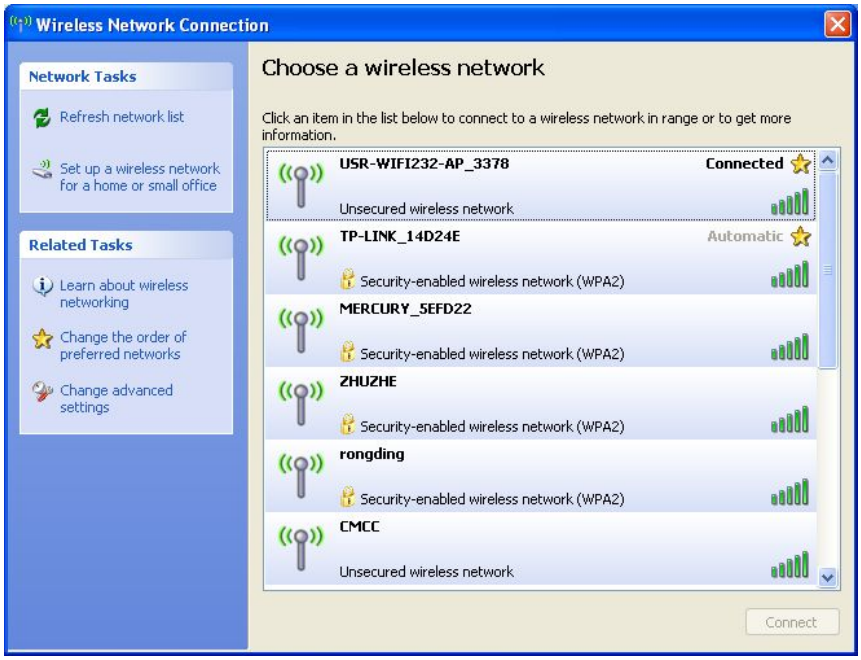



Figure 2 **WIFI Search**

Join the network, choose to automatically obtain IP, WIFI module supports DHCP Server feature and is enabled by default.

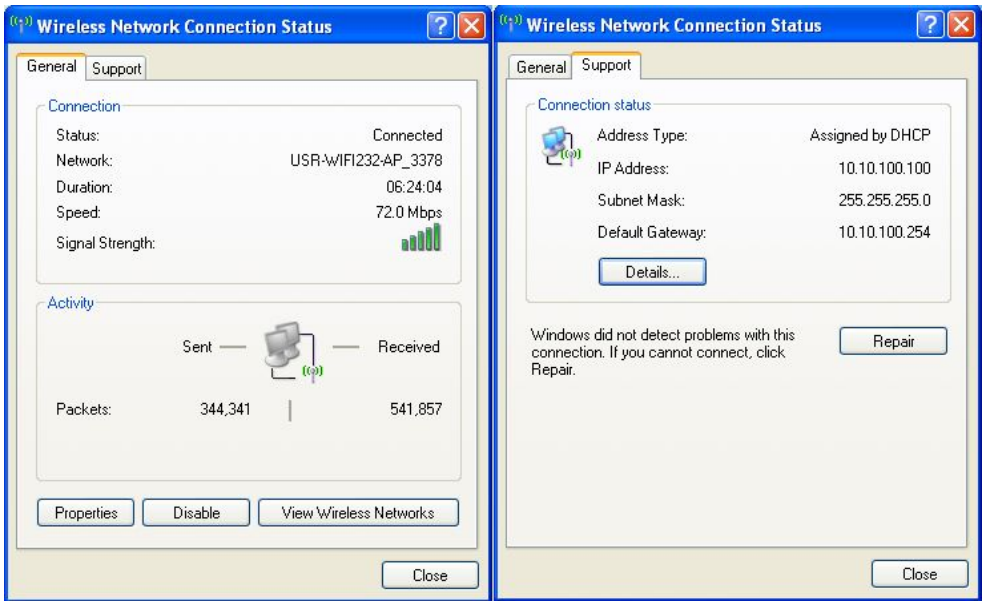



Figure 3 **WIFI connection**

Now, nlink led of USR-WIFI232-A Evaluation Board is lighting.

## 1.3 communication test

Module’s default setting:

- **SSID:**USR-WIFI232-A;
- **Encryption mode:**open，none;
- **UART:**57600,8,1,None;
- **Network parameters：**TCP,Server,8899,10.10.100.254;
- **IP:**10.10.100.254;

We just need to follow the parameters of the corresponding set of network communication parameters, you can make serial <--> WIFI communication, the steps are as follows:

1. Open test software USR-TCP232-Test;
2. COM Settings area (left):

Choose COM port witch has connect the module, there is COM3, choose band rate to 57600, this is the default band rate of WIFI module, Click Open COM port.

3. Net Settings area (right):

Choose TCP client mode, Server IP write 10.10.100.254, it is the WIFI default IP address, Server port to 8899, It is the default Port the WIFI module listen, Click Connect to link to the module.

Now, you can test send data between RS232 and WIFI.

COM port to WIFI: PC RS232 -> Module RS232 -> Module WIFI -> PC WIFI.

WIFI to COM port: PC WIFI -> Module WIFI -> Module RS232 -> PC RS232.

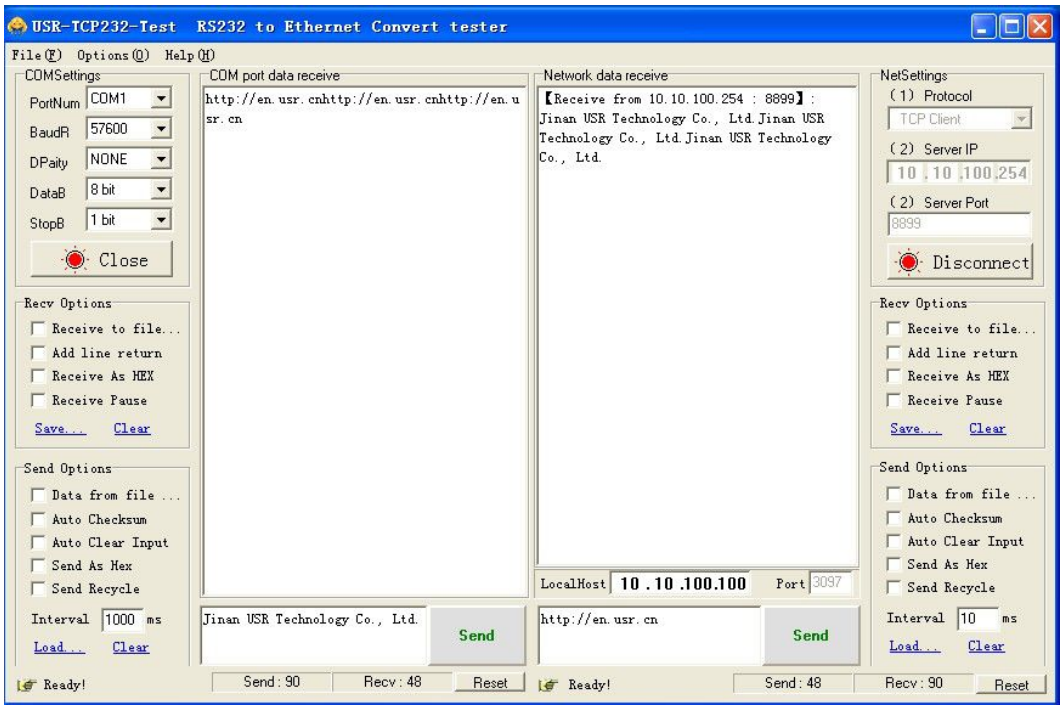



Figure 4 **serial / network transmission test**

# 2 Product Overview

## 2.1 General Description

USR-WIFI232-A/B/C module is an integration of 802.11 b/g/n wi-fi module,which provide a wireless interface to any equipment with a Serial interface for data transfer.

The module used to MAC, baseband chip, RF transceiver unit, as well as the power amplifier;Embedded firmware support wi-fi protocols and configuration, as well as the network TCP/IP protocol stack.

USR-WIFI232-A/B/C uses the industry's highest performance embedded industrial structure, and for the application of smart furniture, smart grid, handheld devices, personal medical, industrial control, etc. These data fields, do a professional optimization.

USR-WIFI232-A/B/C as a hot spot can accommodate 32 clients simultaneously wi-fi access, but also can accommodate 32 TCP client, specific models and parameters of the series modules are as follows:

| | | | |
|---|---|---|---|
| USR-WIFI232-A | 40mm x 25mm， | 2x7 2mm Connector， | Built-in antenna |
| USR-WIFI232-B | 40mm x 25mm， | 2x7 2mm Connector， | I-PEX connector |
| USR-WIFI232-Ca | 40mm x 25mm， | SMT Footprint， | Built-in antenna |
| USR-WIFI232-Cb | 40mm x 25mm， | SMT Footprint， | I-PEX connector |

## 2.2 Device Features

- ✧ **Support IEEE802.11b/g/n Wireless Standards**
- ✧ **Support TCP/IP/UDP Network Protocols**
- ✧ **Support UART/GPIO/Ethernet Data Interface**
- ✧ **Support Work As STA/AP/AP+STA Mode**
- ✧ **Support Router/Bridge Mode Networking**
- ✧ **Support Internal/External Antenna Option**
- ✧ **Support Transparent Transmission Mode**
- ✧ **Support AT+ Instruction Set for Configuration**
- ✧ **Support Friendly Web Configuration Page**
- ✧ **Support Palmodic Signal**
- ✧ **Support UART Auto-Frame Function**
- ✧ **Single +3.3V Power Supply**
- ✧ **Small Size: 25 x 40mm**
- ✧ **FCC/CE Certificated**

## 2.3 Device Paremeters

Table 1 USR-WIFI232-A/B/C Module Technical Specifications

| Class | Item | Parameters |
|---|---|---|
| **Wireless Parameters** | Certification | FCC/CE |
| | Wireless standard | 802.11 b/g/n |
| | Frequency range | 2.412GHz-2.484GHz |
| | Transmit Power | 802.11b: +20 dBm (Max.) |
| | | 802.11g: +18 dBm (Max.) |
| | | 802.11n: +15 dBm (Max.) |
| | | Configurable |
| | Receiver Sensitivity | 802.11b: -89 dBm |
| | | 802.11g: -81dBm |
| | | 802.11n: -71dBm |
| | Antenna Option | External:I-PEX Connector |
| | | Internal:On-board chip antenna |
| **Hardware Parameters** | Data Interface | UART: 1200bps - 230400bps |
| | | GPIOs |
| | | Ethernet: 100Mpbs |
| | Operating Voltage | 3.3V (+/-5%) |
| | Operating Current | 170mA~300mA |
| | Operating Temperature | -25℃- 85℃ |
| | Storage Temperature | -40℃- 125℃ |
| | Dimensions and Size | 25×40×8mm |
| **Software Parameters** | Network Type | Station /AP mode/STA+AP |
| | Security Mechanisms | WEP/WAP-PSK/WAP2-PSK/WAPI |
| | Encryption | WEP64/WEP128/TKIP/AES |
| | Work Mode | Transparent Transmission |
| | Serial command | AT+instruction set |
| | Network Protocol | TCP/UDP/ARP/ICMP/DHCP/DNS/HTTP |
| | Max. TCP Connection | 32 |
| | User Configuration | Web Server＋AT command config. |

## 2.4 Key Application

- Remote equipment monitoring
- Industrial sensors and controls
- Asset tracking and telemetry
- Home automation
- Medical devices

## 2.5 Package Information

### 2.5.1 Recommended Reflow Profile

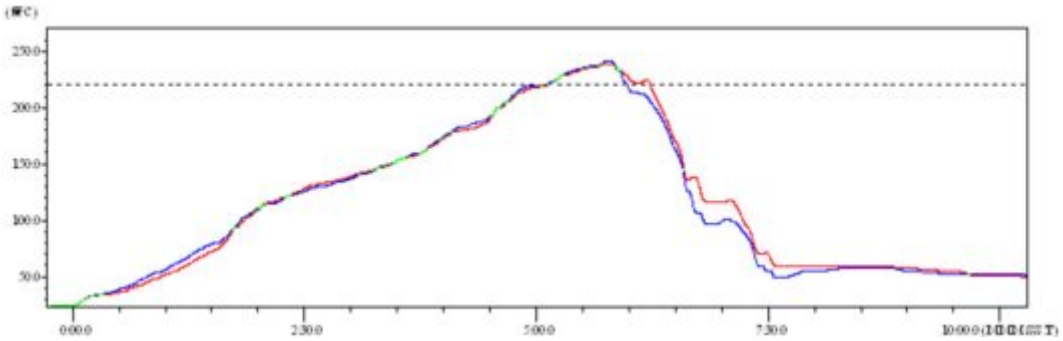


Figure 5 **Reflow Soldering Profile**

Table 2 Reflow Soldering Parameter

| NO. | Item | Temperature (Degree) | Time(Sec) |
|---|---|---|---|
| 1 | Reflow Time | Time of above 220 | 35~55 sec |
| 2 | Peak-Temp | 260 max | |

**Note:**

1. Recommend to supply N2 for reflow oven.
2. N2 atmosphere during reflow (O2<300ppm).

### 2.5.2 Device Handling Instruction (Module IC SMT Preparation)

- Shelf life in sealed bag: 12 months, at <30℃ and <60% relative humidity (RH)
- After bag is opened, devices that will be re-baked required after last baked with window time 168 hours.
- Recommend to oven bake with N2 supplied.
- Baked required with 24 hours at 125±5℃ before rework process for two modules, one is new module and two is board with module.
- Recommend to store at ≦10% RH with vacuum packing.
- If SMT process needs twice reflow:

(1) Top side SMT and reflow . (2) Bottom side SMT and reflow

Case 1: Wifi module mounted on top side. Need to bake when bottom side process over 168 hours window time, no need to bake within 168 hours.

Case 2: Wifi module mounted on bottom side, follow normal bake rule before process.

Note:

Window time means from last bake end to next reflow start that has 168 hours space.

### 2.5.3 Shipping Information

Figure 6 **Shipping Information**

**TRAY** Size: 420*245*34 mm

**Note:**

1 tray = 5*20 pcs = 100 pcs

1 box = 2 trays = 2*100 pcs = 200pcs

1 carton = 4 boxes = 4*200 pcs = 800pcs

# 3 Hardware Introduction

## 3.1 Pins Definition

### 3.1.1 USR-WIFI232-A/B Pins Definition

Figure 7 **USR-WIFI232-A/B**

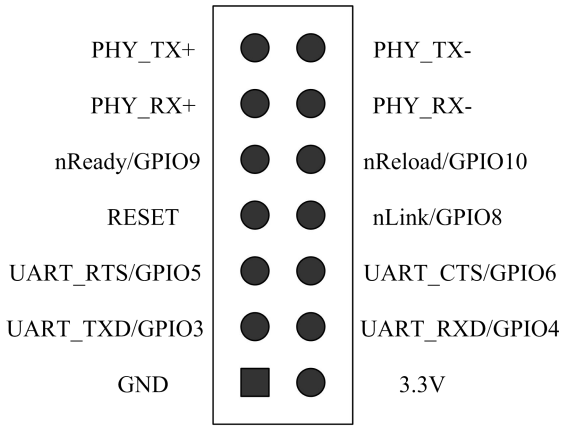



Figure 8 **USR-WIFI232-A/B Pins Map**

Table 3 USR-WIFI232-A/B Pins Definition

| Pin | Description | Name | Direction | Note |
|---|---|---|---|---|
| **1** | Ground--GND | GND | Power | Ground |
| **2** | VCC 3.3V@350mA | 3.3V | Power | 3.3V @ 350mA power input |
| **3** | UART Data Transmit | UART_TXD | O | If not use UART function, this 4 pins can be configured as GPIO pins, and can change GPIO pin status through AT command |
| | GPIO | GPIO3 | I/O | |
| **4** | UART Data Receive | UART_RXD | I | |
| | GPIO | GPIO4 | I/O | |
| **5** | UART sends request of data transmission | UART_RTS | O | |
| | GPIO | GPIO5 | I/O | |
| **6** | UART receives data transmission permission | UART_CTS | I | |
| | GPIO | GPIO6 | I/O | |
| **7** | Module reset signal | RESET | I | “Low ( 0 )” effective reset input.<br>The reset duration should be kept more than 300ms |
| **8** | WiFi status Indication | nLink | O | “1”- WIFI connection available, “0”- No WIFI connection<br>Can be configured as GPIO. |
| | GPIO | GPIO8 | I/O | |
| **9** | Indicate the module status of power on process | nReady | O | “0” or “Palmodic Signal” - Finish module boot up process;<br>“1” - Module boot up not finish.<br>Can be configured as GPIO. |
| | GPIO | GPIO9 | I/O | |
| **10** | Restore configuration | nReload | I | Module will Restore factory default configuration after set this pin “0” more than 1s, then set “1”. |
| | GPIO | GPIO10 | I/O | |
| **11** | Ethernet Input+ | PHY_RX+ | I | +1.8V Ethernet Data Interface |
| **12** | Ethernet Input- | PHY_RX- | I | |

| | | | | |
|---|---|---|---|---|
| **13** | Ethernet Output+ | PHY_TX+ | O | Support transformer and direct connection (AC couple) mode. |
| **14** | Ethernet Output- | PHY_TX- | O | |

### 3.1.2 USR-WIFI232-Ca/Cb Pins Definition

Figure 9 **USR-WIFI232-Ca/Cb**

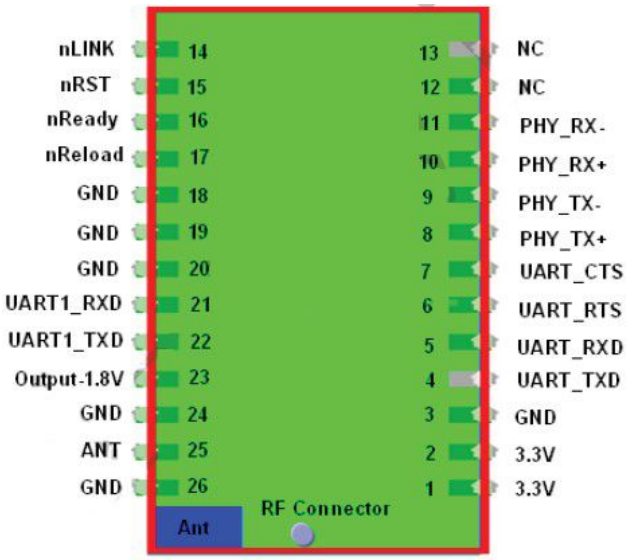



Figure 10 **USR-WIFI232-Ca/Cb Pins Map**

Table 4 USR-WIFI232-Ca/Cb Pins Definition

| Pin | Description | Name | Direction | Note |
|---|---|---|---|---|
| 3,18,19, 20,24,26 | GND | GND | Power | Ground |
| 1, 2 | VCC | 3.3V | Power | 3.3V @ 350mA power input |
| 4 | UART Data Transmit | UART_TXD | O | If not use UART function, this 4 pins |
| | GPIO | GPIO3 | I/O | |

| | | | | |
|---|---|---|---|---|
| 5 | UART Data Receive | UART_RXD | I | can be configured as GPIO pins, and can change GPIO pin status through AT command |
| | GPIO | GPIO4 | I/O | |
| 6 | UART sends request of data transmission | UART_RTS | O | |
| | GPIO | GPIO5 | I/O | |
| 7 | UART receives data transmission permission | UART_CTS | I | |
| | GPIO | GPIO6 | I/O | |
| 8 | Ethernet output+ | PHY_TX+ | O | +1.8V Ethernet Data Interface(Module with external 1.8V reference voltage) |
| 9 | Ethernet output- | PHY_TX- | O | |
| 10 | Ethernet Input+ | PHY_RX+ | I | |
| 11 | Ethernet Input- | PHY_RX- | I | |
| 14 | WiFi status Indication | nlink | O | “0”- WIFI connection available, “1”- No WIFI connection. |
| 15 | Module reset signal | nRST | I | “Low ( 0 )” effective reset input.<br>The reset duration should be kept more than 300ms |
| 16 | Indicate the module status of power on process | nReady | O | “0” - Finish module boot up process;<br>“1” - Module boot up not finish. |
| 17 | Restore configuration | nReload | I | Module will Restore factory default configuration after set this pin “0” more than 1s, then set “1”. |
| 21 | UART1 Data Receive | NC | NC | |
| 22 | UART1 Data Transmit | NC | NC | |
| 23 | Output 1.8V | 1.8V | O | 1.8V@300mA, to the Eth application |
| 25 | 2.4GHz Antenna | ANT | O | 50ohm impedance control line |
| 12,13 | Retain | NC | NC | |

## 3.2 Mechanical Size

USR-WIFI232-A/B/C modules physical size (25x40mm) as follows:

### 3.2.1 USR-WIFI232-A/B

USR-WIFI232-A/B module Mechanical Size:

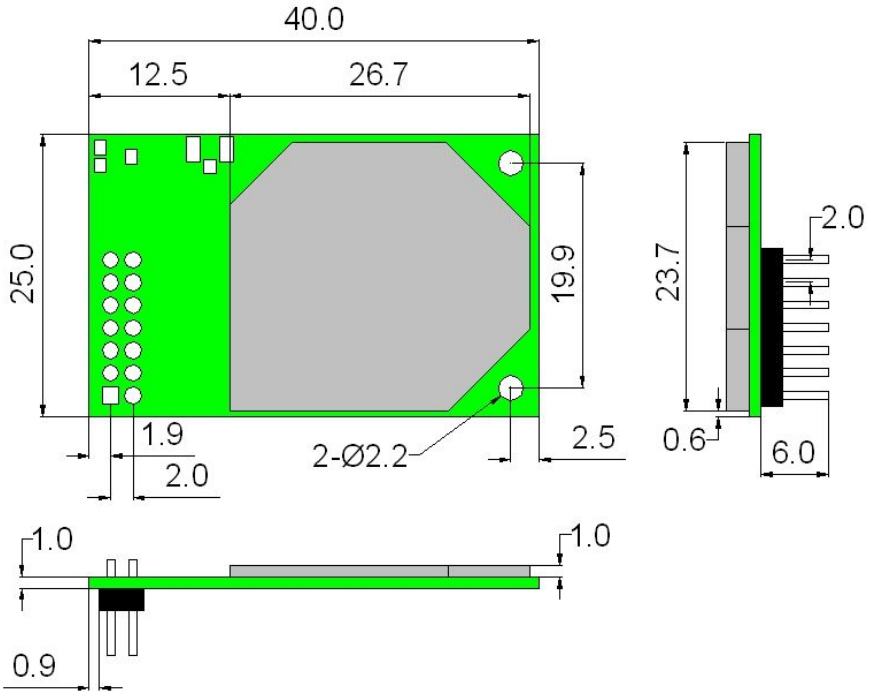



Figure 11 **USR-WIFI232-A/B Mechanical Size**

## 3.2.2 USR-WIFI232-Ca/Cb

USR-WIFI232-Ca/Cb module Mechanical Dimension:

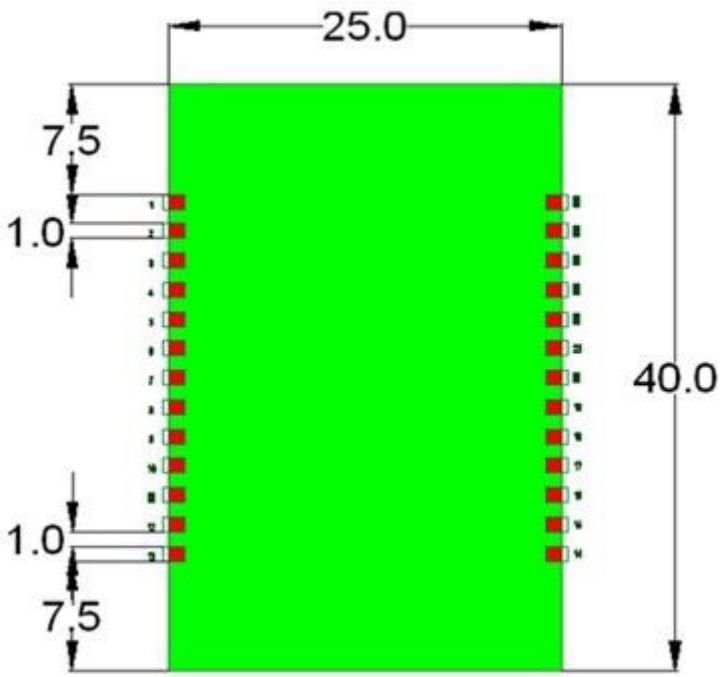



Figure 12 **USR-WIFI232-Ca/Cb Mechanical Dimension**

## 3.3 Antenna

### 3.3.1 On-board Chip Antenna

USR-WIFI232-A/B/C supports a built-in antenna options, when customers choose a built-in antenna, must comply with the following built-in antenna module placement of notes and general rules:

- Be in the user's PCB board, and the red region ( 6X8mm ) corresponding to the region cannot be placed components and with GND;
- Antenna must away from the metal, at least to the distance around the higher components above 10MM;
- Antenna cannot be shielded by any meal enclosure; All cover, include plastic, shall away from antenna at least 10MM;

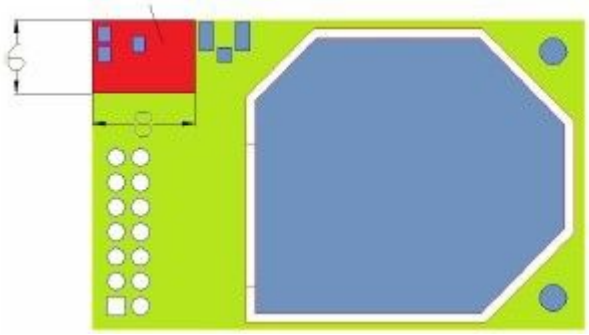


Figure 13 **USR-WIFI232-A/B/C Chip Antenna Keep Out Region**

USR technological suggestions USR-WIFI232-A/B/C module be placed in the following areas of user board, in order to reduce the antenna and a wireless signal influence, at the same time, please consult with technology and technical support staff to assist module placement and associated regions of Layout design.

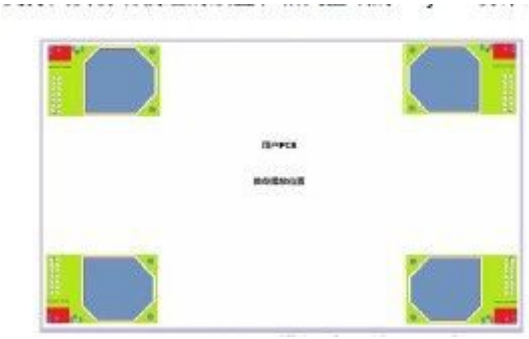


Figure 14 **Suggested Module Placement Region**

### 3.3.2 External Antenna

USR-WIFI232-A/B/C modules support internal antenna and external antenna option for user dedicated application. If user select external antenna, USR-WIFI232-A/B/C modules must be connected to the 2.4G antenna according to IEEE 802.11b/g/n standards.

The antenna parameters required as follows:

Table 5 USR-WIFI232-A/B/C External Antenna Parameters

| Item | Parameters |
|---|---|
| Frequency range | 2.4~2.5GHz |
| Impedance | 50 Ohm |
| VSWR | 2 (Max) |
| Return Loss | -10dB (Max) |
| Connector Type | I-PEX or populate directly |

## 3.4 Evaluation Kit

USR provides the evaluation kit to promote user to familiar the product and develop the detailed application. The evaluation kit shown as below, user can connect to USR-WIFI232-A/B/C module with the RS-232 UART port, 100M Eth port or Wireless port to configure the parameters, manage the module or do the some functional tests.

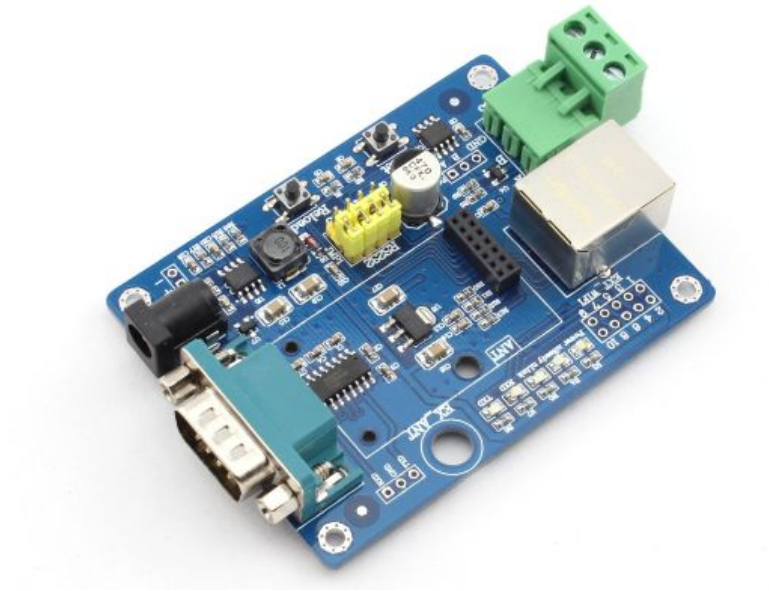


Figure 15 **USR-WIFI232-A/B module Evaluation Kit**

Table 6 USR-WIFI232-A/B Evaluation Kit Interface Description

| Function | Name | Description |
|---|---|---|
| **External Interface** | DC jack | 5V power input connector |
| | DB9 | Male serial jack of 9-pin,and used to connect to PC |
| | RJ-45 | 100M Eth Interface |
| | Module | 2x7 2mm DIP connector, connect WIFI module |
| **LED** | Power (Red) | 3.3V Power Indicator |
| | TXD | TXD Indicator |
| | RXD | RXD Indicator |
| | Ready | nReady/GPIO Indicator |
| | Link | nLink/GPIO Indicator |
| **Button** | Reset | Used to reset the module. |
| | Reload | Module restore to factory default configuration. |

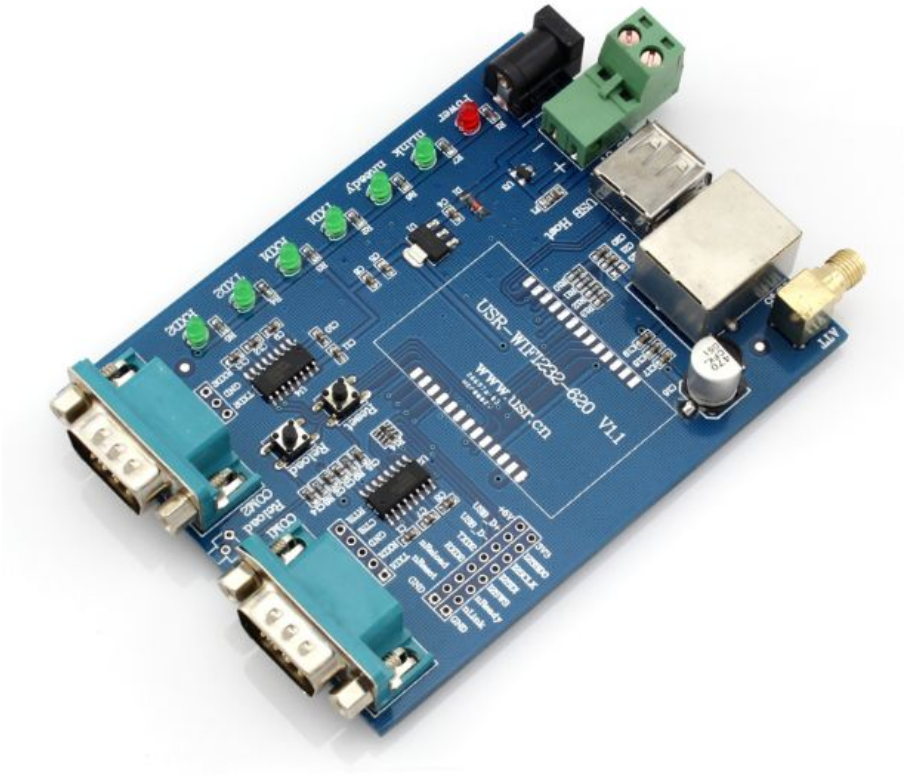



Figure 16 **USR-WIFI232-Ca/Cb module Evaluation Kit**

Table 7 USR-WIFI232-Ca/Cb module Evaluation Kit Interface Description

| Function | Name | Description |
|---|---|---|
| External Interface | DB9 | Male serial jack of 9-pin,and used to connect to PC |
| | RJ-45 | 100M Eth Interface |
| | Mini USB | B－type interface,AS 5v@1A power input port |
| | Module | 2x7 2mm DIP connector |
| LED | Power (Red) | 3.3V Power Indicator |
| | CTS (Green 1) | CTS/GPIO Indicator |
| | RTS(Green 2) | RTS/GPIO Indicator |
| | Reload(Green 3) | nReload/GPIO Indicator |
| | Ready(Green 4) | nReady/GPIO Indicator |
| | Link(Green 5) | NLink/GPIO Indicator |
| Button | Reset | Used to reset the module. |
| | Reload | Module restore to factory default configuration. |

## 3.5 Hardware Reference Design

### 3.5.1 Hardware Typical Application

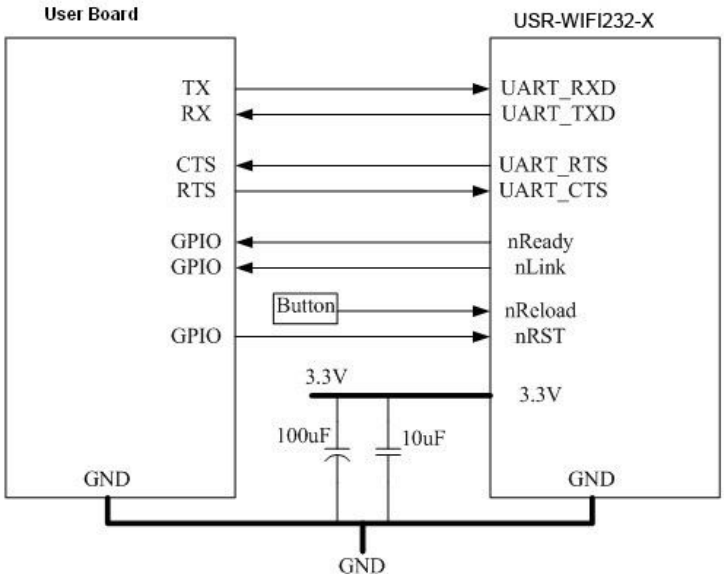



Figure 17 **USR-WIFI232-A/B/C Hardware Typical Application**

**Notes：**

**nRST-** Module hardware reset signal. Input. Logics “0” effective.

There is 100K Ohm pull-up resister internal up to 3.3V. When module power up or some issue happened, MCU need assert nRST signal “0” at least 300ms, then set” 1” to keep module fully reset.

**nReady-** Module boot up ready signal. Output. Logics “0” effective.
There is 4.7K Ohm pull-up resister internal up to 3.3V. The module will output “0” “or “Palmodic Signal” after normal boot up. This signal used to judge if module finish boot up and ready for application or working at normal mode.

**nLink-** Module WIFI connection indication. Output.
There is 4.7K Ohm pull-up resister internal up to 3.3V. When module connect to AP (STA mode) or some WiFi STA connect to module (AP mode), the module will output “0”. This signal used to judge if module already at WiFi connection status.

**nReload**- Module restore to factory default configuration.Input. Logics “0” effective.
User can assert nReload signal “0” more than 3’s through button or MCU pin, then release, module will restore to factory default configuration and re-start boot up process. User need add 4.7K~10K Ohm pull-up resister external the module. If not use this function, then can use AT command AT+FRLDEN=off to disable it.

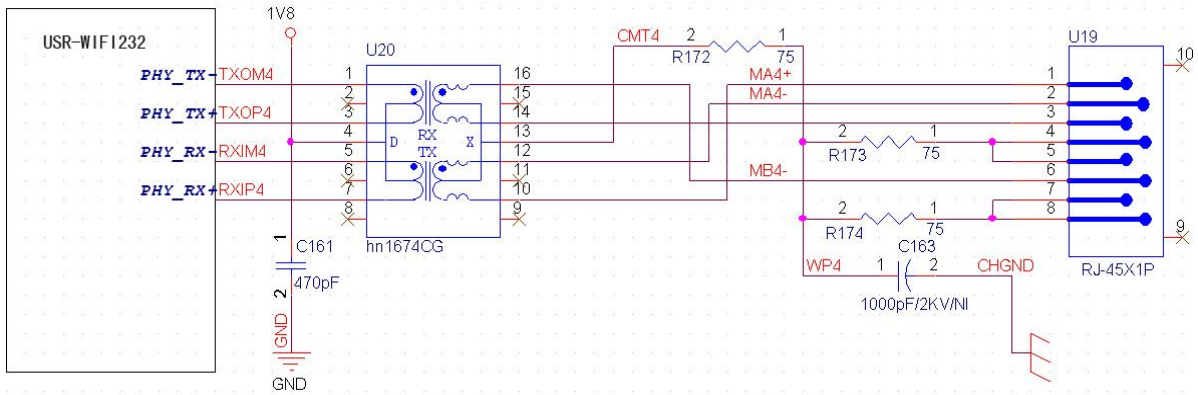
UART_TXD/RXD- UART port data transmit and receive signal.
There is 1K Ohm pull-down resister internal. User can’t add pull-up resister at these pins.

## 3.5.2 10/100M Ethernet Interface

USR-WIFI232-A/B/C modules provide one 10/100M Ethernet PHY layer interface for data transition or user configuration. This Ethernet support with transformer and without transformer (PHY-to-PHY) 2 kinds of connection.

### 3.5.2.1 Ethernet Connection with Transformer

User board put Ethernet transformer and RJ-45 connector. This is a general 10/100M Ethernet phy layer connection. The reference design as following:




(Above is for USR-WIFI232-A/B pin type module, Below is for SMD type USR-WIFI232-C)

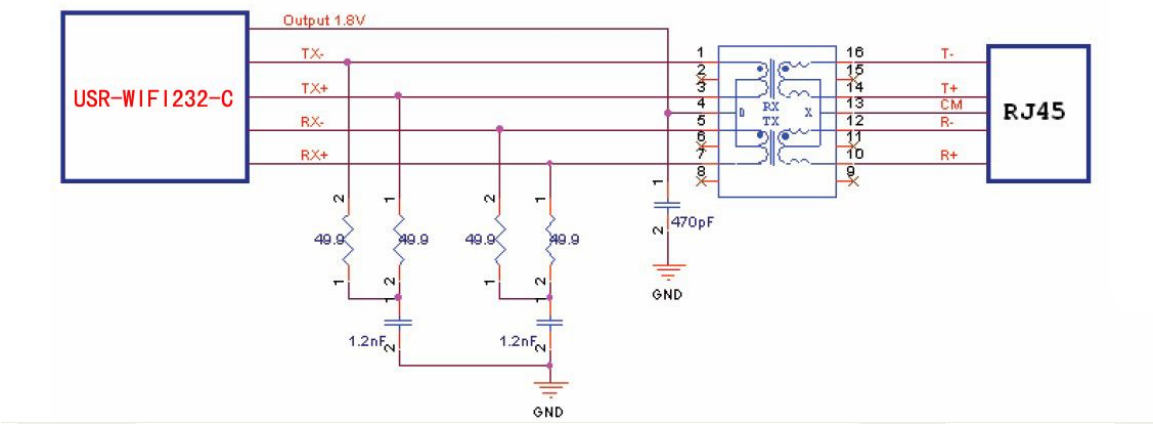
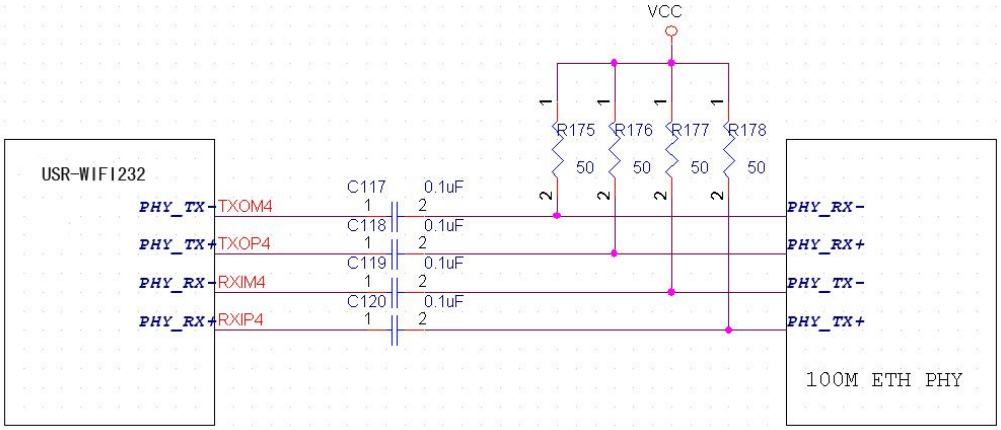



Figure 18 **Ethernet Reference Design with Transformer**

### 3.5.2.2 Ethernet Connection without Transformer

For this application, Ethernet will work as internal data transmition interface and save one transformer and RJ45 connector. Ethernet PHY-to-PHY connection will use AC coupled connection. This is a space and cost optimized solution. Hardware reference design as following:

Note: VCC signal at reference design shall base on user board PHY chipset voltage level, such as 2.5V power supply for general Ethernet PHY chipset.




(Above is for USR-WIFI232-A/B pin type module, Below is for SMD type USR-WIFI232-C)

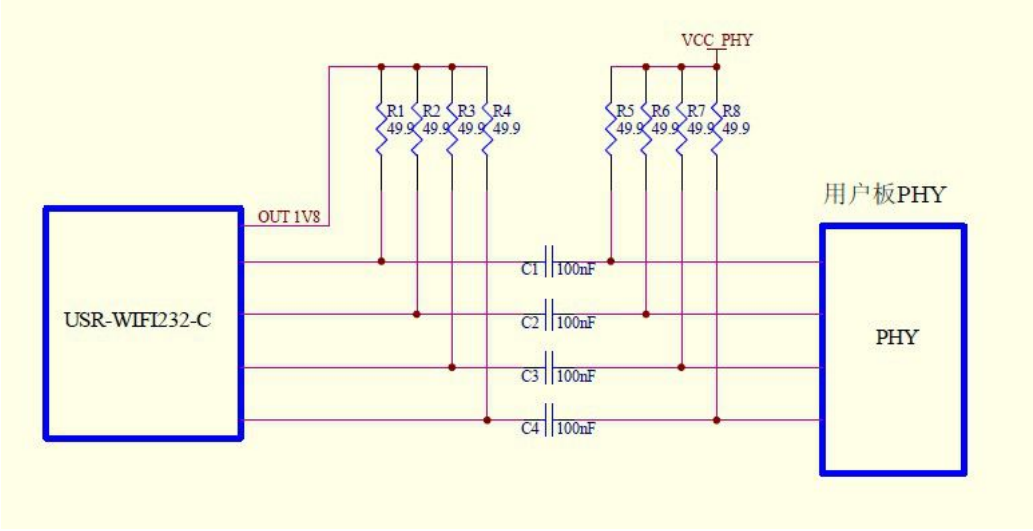
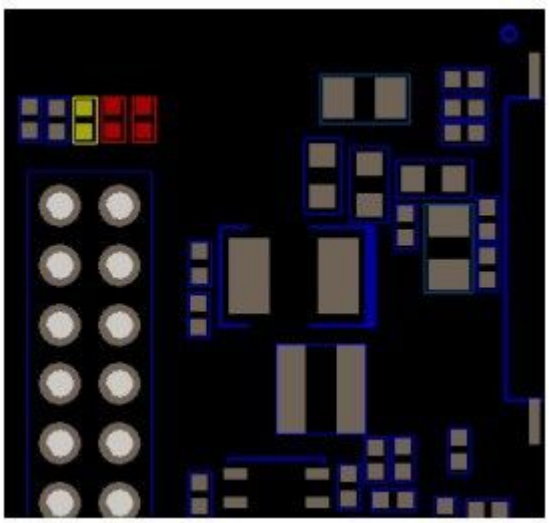


Figure 19 **Ethernet Reference Design without Transformer**

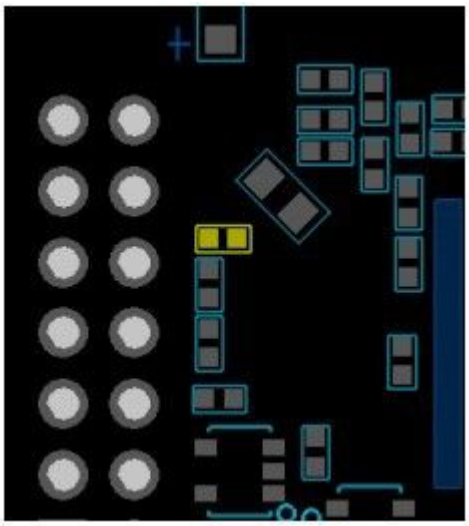
This module Ethernet interface default is for the application with transformer connection. If you need PHY-PHY directly connection, please change the hardware as follows:

**1. Weld 0 ohm resistance in red position**

**2. Remove the component in yellow position**



BOT side component



TOP side component

Figure 20 **Schematic resistance changes**

Specific PHY-PHY direct connection reference to user manual chapter 1.3.2.2 application of Ethernet without transformer and AT+FEPTP command

The command:

AT+FVEW=enable<CR> to open ethernet WAN port function

Remark:

1. Only when ethernet as WAN, this command is needed. Module default LAN port.
2. After this command, make sure module WAN IP and LAN IP in different segment. (Modify the ALN IP in AP Settings, modify the WAN IP in STA Settings)

AT+FEPTP=on<CR> Quey/set default ethernet PHY-PHY on/off

AT+FEPHY=on<CR> Open ethernet function permanently

AT+RELD<CR> Command with “F” need to be affective after AT+RELD

After module reset, command effect, then will not impact by Reload

For user’s design, pls note:

1. Cable connection should be AC coupling, your cable need be pulled up to VCC (fit with PHY chip level)
2. Cable TX connected to RX. In PHY-PHY direct connection, PHY chip dose not support direct/ cross self-adaption
3.Your PHY chip on board should better to be forced into 100M work mode

### 3.5.3 UART Interface

UART interface is the serial data transmition interface mainly used for USR-WIFI232-A/B/C modules.

User can add RS-232 chipset on user board and convert the signal to RS-232 voltage to communicate with outside equipment or sensors. USR-WIFI232-A/B/C modules UART interface include 4 general signals: TXD/RXD/RTS/CTS. The hardware reference design with RS-232 chipset as following:

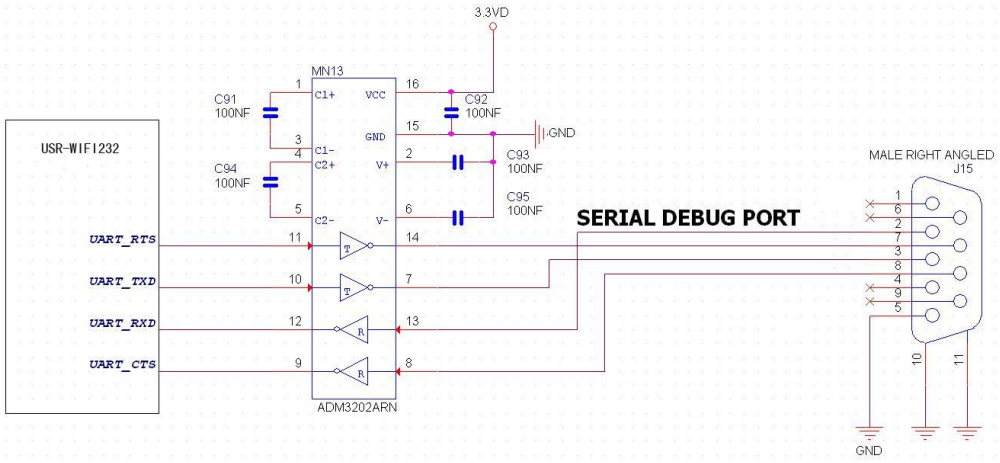



Figure 21 **Figure 10 UART Interface Reference Design**

**Notes:** TXD pin is also hardware configuration pin internal module. So this pin MUST pull-down during module power up. USR-WIFI232-A/B/C modules provide internal pull-down resister, user can't add pull-up/pull-down resister on user board, which may cause module can't work.

### 3.5.4 Power Interface

USR-WIFI232-A/B/C module support single +3.3V power supply. The peak current shall about 350mA and normal WiFi working current shall about 200mA. The power save (WiFi OFF) mode will about 100mA

Decoupling at power pin suggested, At least one 100uF and one 10uF capacitor required at user board and put near module power input pin will increase the reliability and performance.

# 4 Modules Function Description

## 4.1 User configuration process

After USR-WIFI232-A/B/C module electric starter, based on user pre-set parameters, automatically connect to wireless networks and servers, and enter the working mode is set to open in accordance with the default serial port parameters.

The parameters which need to configure include:

- Wireless Network Parameters
  - Wireless Network Name（SSID）
  - Security Mode
  - Encryption Key
- TCP/UDP Linking Parameters
  - Protocol Type
  - Link Type（Server or Client）
  - Target Port ID Number
  - Target Port IP Address
- Serial Port Parameters
  - Baud Rate
  - Data Bit
  - Parity (Check) Bit
  - Stop Bit
  - Hardware Flow Control
- Work Mode Selection
  - Transparent transmission/Serial command mode/GPIO1 mode/GPIO2 mode

The following sections will introduce specific to each part in detail.

## 4.2 Working mode

### 4.2.1 Transparent Transmission Mode

USR-WIFI232-A/B/C modules support serial interface transparent transmission mode. The benefit of this mode is achieves a plug and play serial data port, and reduces user complexity furthest. In this mode, user should only configure the necessary parameters. After power on, module can automatically connect to the default wireless network and server.

As in this mode, the module's serial port always work in the transparent transmission mode, so users only need to think of it as a virtual serial cable, and send and receive data as using a simple serial. In other words, the serial cable of users' original serial devices is directly replaced with the module; user devices can be easy for wireless data transmission without any changes.

The transparent transmission mode can fully compatible with user's original software platform and reduce the software development effort for integrate wireless data transmission.

**Notes:** Users also open the serial port hardware flow control (CTS/RTS) function, so that we can make the bit error rate to a minimum.If the user doesn't need hardware flow control function of the serial port, only need to the corresponding pin foot (CTS/RTS) hung up.

### 4.2.2 Serial command mode

In this mode, the user can send the serial data to a different server address, this pattern can be use udp or TCP client sends data to the server.
Customer MCU send packets according to the following format, parsing module is finished, only the n bytes of data sent to the destination address.When data is returned, not analytical data from serial port output directly.

Table 8 Protocol table of Serial command mode

| frame header | length | function byte | Backup data area | Destination port | Target address | Data | Sum check |
|---|---|---|---|---|---|---|---|
| 2 | 2 (n+m+5) | 1 | 2 | 2 | m | n | 1 |

**frame header：**

0x55 0xAA（Constant）

**Length：**

Starting from the function byte, to Sum check (does not contain the sum check) all bytes. High byte at the front

**Function byte：**

Bit0:（UDP:0 ;TCP:1）
Bit1:（Short connection:0;Long connection:1）
Bit2:（IP:0;Domain name:1）
Bit7:（cut protocol:0;full protocol:1）Note: currently only supports cut protocol

Notes:

- ✧ Bit1:If it is a short connection, it sends data, and then will be disconnected; if it is long connection, it sends data, connection will remain, until the re changing the target address.
- ✧ Bit2:Indicates that the target address is IP or domain name. If it is IP, the target address is 4 bytes; if the domain name, the target address length for the entire domain name string length (the last byte address is '\0', that is the end of the string).
- ✧ Bit7:Under the cut protocol, reply frame contains only data; Under the full protocol, reply frame has "failed to send", "waiting for", "UDP radio response equipment IP" frame data.

**Backup data area:**

- ✧ First byte:If it is a short connection, this position is TCP waits for the timeout time (1-255), if the send command is completed, did not receive a response, then wait a few seconds and the corresponding, if 5, said to wait for the 5S to disconnect; if the sending command, immediately receive the returned data, then immediately disconnected; if it is long connection, this position is 0x00.
- ✧ Second byte:Reserve

**Destination port:**

Little endian, low byte in the former,such as port 23, here are 0x17 0x00

**Target address:**

If it is IP, is 4 bytes, for example, 192.168.0.7 said 0x07 0x00 0xA8 0xC0; if it is a domain name, then the address of indefinite length,ending with the'\0'.

**Data:**

Variable length,the maximum not exceeding 1000bytes.

**Sum check:**

From the function word to check byte (does not contain a check byte), add Sum check.

The following is an example of a specific application:

send data:0x55 0xaa 0x00 0x0a 0x00 0x00 0x00 0x21 0x00 0x85 0x00 0xA8 0xC0 0x01 0x0f

Length:0x00 0x0a

Function byte:0x00 (UDP;Short connection;IP;cut protocol)

Destination port:0x21 0x00(33)

Target address:0x85 0x00 0xA8 0xC0 (192.168.0.133)

Data:0x01(data length :1)

Sum check:0x0f (0x00+0x00+0x00+0x21+0x00+0x85+0x00+0xA8+0xC0+0x01=0x0f)

### 4.2.3 GPIO 1 mode/GPIO 2 mode

USR-WIFI232-A/B/C module support 2 GPIO mode: GPIO-1 and GPIO-2. At GPIO-1 mode, UART (TXD/ RXD/CTS/RTS) defined as GPIO and others (nReady/nLink/nReload) defined as functional pin. At GPIO-2, all these 7 pins defined as GPIO. So, GPIO mode not supports UART communication.

When module works at GPIO mode, PC and other equipments can setup connection (TCP/UDP) through WiFi, then read/write GPIO information through command.

- GPIO n IN, Set GPIOn as input, Response GPIO OK or GPIO NOK;
- GPIO n OUT 0, Set GPIOn as output and output ‘0’, Response GPIO OK or GPIO NOK;
- GPIO n OUT 1, Set GPIOn as output and output ‘1’, Response GPIO OK or GPIO NOK;
- GPIO n SW, Set GPIOn as output and switch the output status, Response GPIO OK or GPIO NOK;
- GPIO n PWM m1 m2, Set GPIOn output a wave: m1 is ‘high’ duration and m2 is ’ low’ duration (Time unit is ‘ms’ and minimal is 10ms), Response GPIO OK or GPIO NOK;
- GPIO n GET, Read GPIOn status, Response I0,I1,O0,O1, means ” input low ” ,” input high”,” output low”,” output high”

Notes: n can be 3, 4, 5, 6, 8, 9, 10 corresponding module pin. GPIO 4 and 10 can only defined as input and GPIO 3 can only defined as output.

GPIO READ returns all current IO status, and GPIO n GET said method. Such as, I1I1I0I0I0I0O1, I said input, O output. 0 low, 1 express high.4 and 10 of the two pin is negated. Read the 1 actual 0 actual 1, read the 0.

## 4.3 Wireless Networking

USR-WIFI232-A/B/C module can be configured as both wireless STA and AP base on network type. Logically there are two interfaces in USR-WIFI232-A/B/C. One is for STA, and another is for

AP. When USR-WIFI232-A/B/C works as AP, other STA equipments are able to connect to wireless LAN via USR-WIFI232-A/B/C module. Wireless Networking with USR-WIFI232-A/B/C is very flexible.

Following figure shows the functional architecture of USR-WIFI232-A/B/C module:

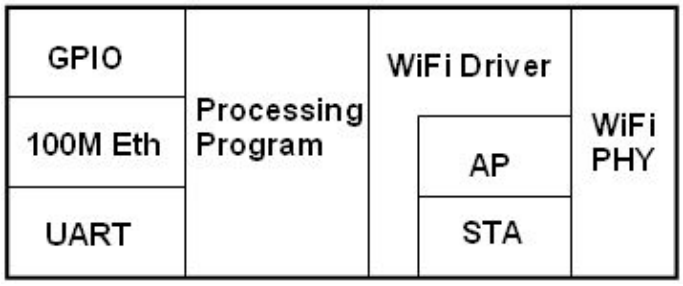



Figure 22 **USR-WIFI232-A/B/C Functional Architecture**

**Notes:**

**AP:** that is the wireless Access Point, the founder of a wireless network and the center of the network nodes. The wireless router we use at home or in office may be an AP.

**STA:** short for Station, each terminal connects to a wireless network (such as laptops, PDA and other networking devices) can be called with a STA device.

### 4.3.1 STA

Infrastructure: it's also called basic network. It built by AP and many STAs which join in.

The characters of network of this type are that AP is the center, and all communication between STAs is transmitted through the AP. The figure following shows such type of networking.

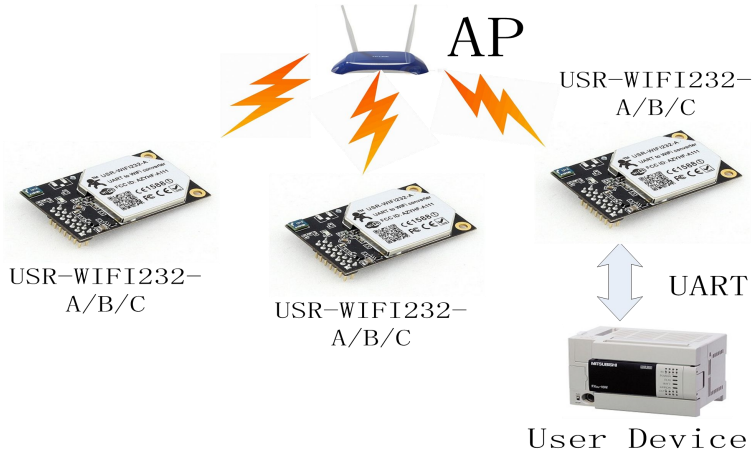



Figure 23 **USR-WIFI232-A/B/C Basic Wireless Network Structure**

### 4.3.2 AP

Because USR-WIFI232-A/B/C can be set to AP, can also be set to STA, so the USR-WIFI232-A/B/C can be achieved easily wireless ad hoc network.

As showing in the figure below, USR-WIFI232-A/B/C (1) can be treat as an AP, and USR-WIFI232-A/B/C (2), USR-WIFI232-A/B/C (3) and the laptop are STAs connected to USR-

WIFI232-A/B/C (1). Meanwhile, all USR-WIFI232-A/B/C modules can connected to user device via UART interface. All USR-WIFI232-A/B/C modules can be operated and managed through the laptop. So it is convenient to O&M all USR-WIFI232-A/B/C modules. Moreover, in such Adhoc network structure, the whole coverage of a wireless network can be extended easily.

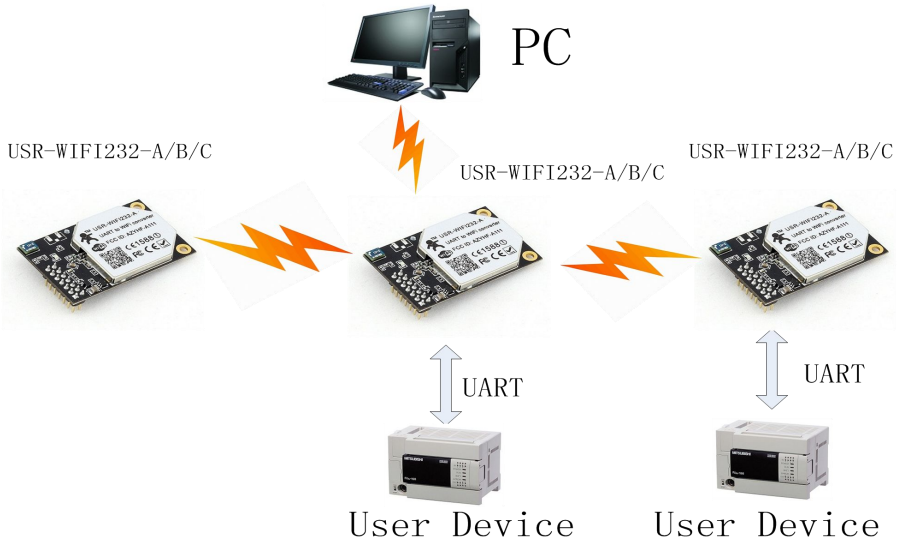



Figure 24 **USR-WIFI232-A/B/C STA Network Structure**

### 4.3.3 AP+STA

USR-WIFI232-A/B/C module support AP+STA network mode, means module support one AP interface and one STA interface at the same time, as following figure,

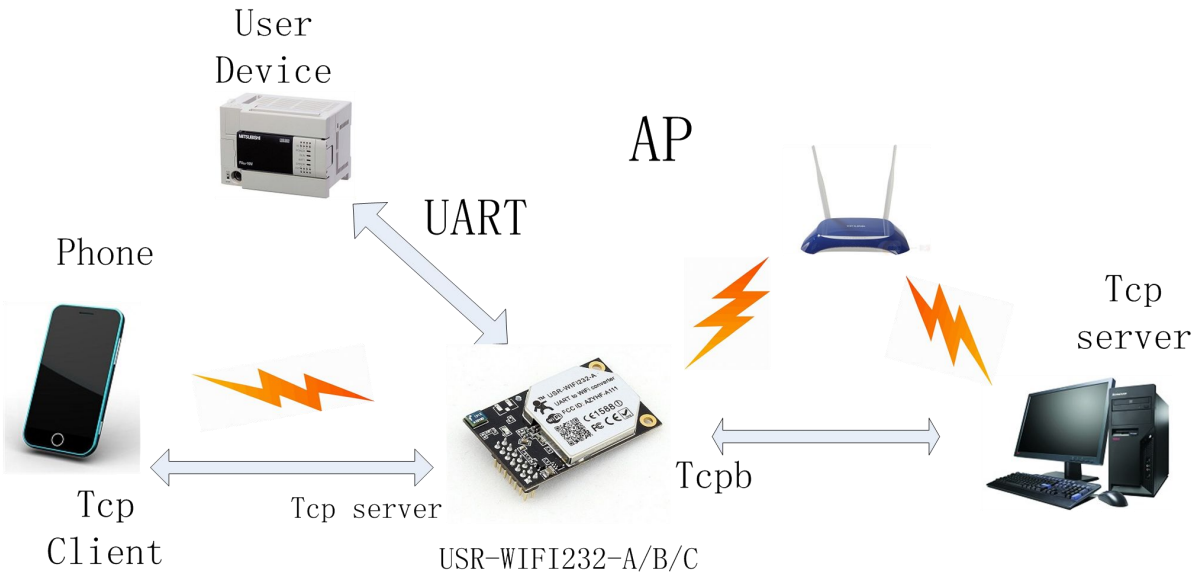



Figure 25 **USR-WIFI232-A/B/C AP+STA Network Structure**

When module enables AP+STA function, Module's STA interface can connect with router and connect to TCP server in the network. At the same time, module's AP interface is also active and

permit phone/PAD to connect through TCPB, then phone/PAD can control user device and and setting the module parameters,

The advantage of AP+STA mode is:

- Users can easily setting and track user device through Phone/PAD and not change the orginal network setting.
- Users can easily setting module's parameters through WiFi when module works as STA mode.

**AP+STA Mode Setting:**

AP+STA mode need serial AT command to enable as follows:

- AT+FAPSTA=on, Enable AP+STA mode;
- Then, when you configure module works as STA mode, it's AP interface still active;

**AP+STA Mode Notes:**

When user enable AT+STA function,the STA port need to keep connected with other router(AP),

or STA port will have to scan the AP frequently ,which will affect AP port function and may cause some date loss.

So ,if user confirm STA port can't connect with AP at some time,user can disable the STA scan through the following command:

- AT+STTC=on/off,on:Scan AP;off:No Scan AP.

After re-start module,this command not saved;

- AT+FSTTC=on/off;

This command is saved after re-staring the module;

## 4.4 Ethernet Interface Communication

USR-WIFI232-A/B/C module provides one 100M Ethernet interface. With this Ethernet interface, user can easily realize the three interface (WiFi, UART, and Ethernet) intercommunication and networking. USR-WIFI232-A/B/C module can configured as Bridge Mode or Router Mode base on different networking technology.

Notes: As the Ethernet mode will increase additional consumption, so it is default closed. If you need this function, pls use AT+FEPHY=on to open it and RELD can't change this. For different application, USR-WIFI232-610 need version switch via commands (such as following description of N-ver and Z-ver). With command AT+FVER=n to switch to N-ver and with command AT+FVER=z to switch to Z-ver.

### 4.4.1 USR-WIFI232-A/B/C Ethernet Interface Networking (As AP)

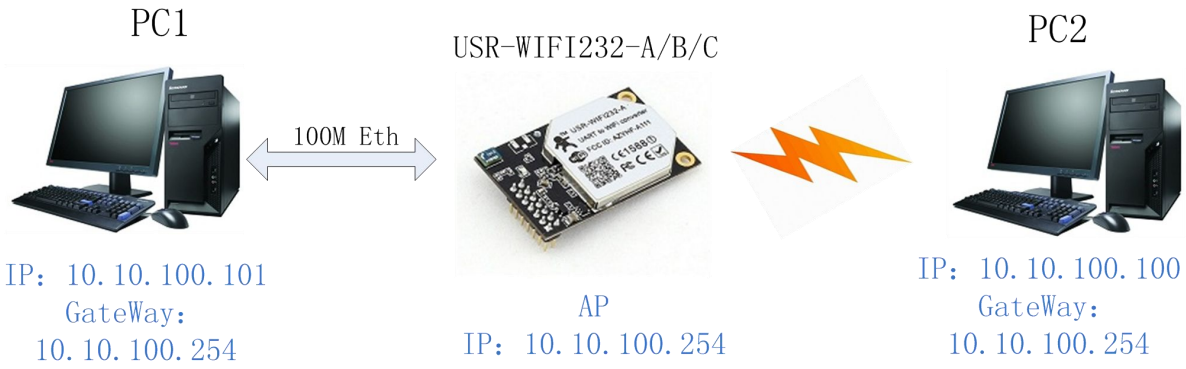



Figure 26 **USR-WIFI232-A/B/C Ethernet Interface Networking (As AP)**

USR-WIFI232-A/B/C module works as AP and also the center of this network. All devices' IP address in this network shall use the same network segment with USR-WIFI232-A/B/C and they can ntercommunication with this method.

### 4.4.2 USR-WIFI232-A/B/C Ethernet Interface Networking (As STA, N-Ver)

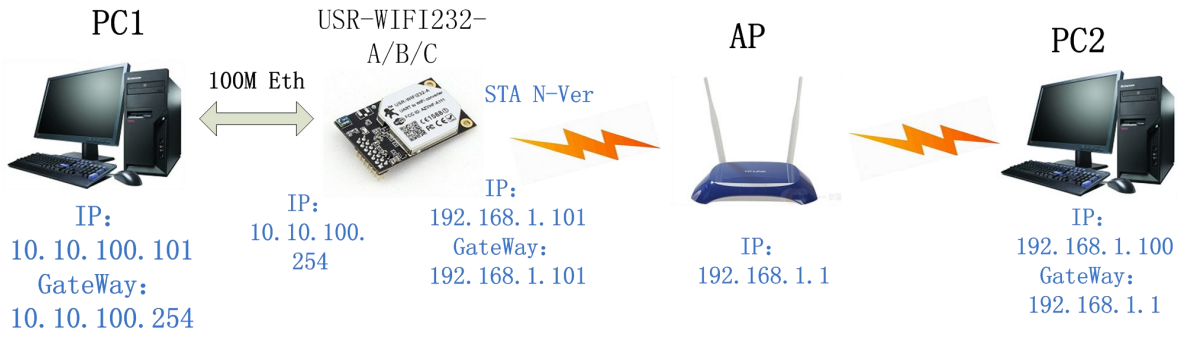



Figure 27 **USR-WIFI232-A/B/C Ethernet Interface Networking (As STA, N-Ver)**

USR-WIFI232-A/B/C module works as STA (Software is N-Version), and module set as router mode. When module connect to AP, it will get wireless port IP address from AP (For example: 192.168.1.100). At the same time, module also form a subnet (Default 10.10.100.254) and all devices connected to module Ethernet interface will get assigned IP address (For example: 10.10.100.101).So as shown, PC1 at internal subnet can initiate a connection to PC2 (For USR-WIFI232-A/B/C works as router mode), but PC2 can't active initiate a connection to PC1.

### 4.4.3 USR-WIFI232-A/B/C Ethernet Interface Networking (As STA, Z-Ver)

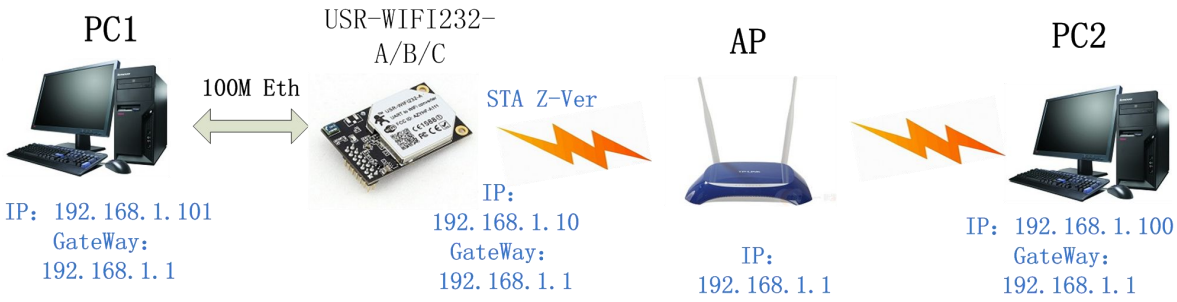



Figure 28 **USR-WIFI232-A/B/C Ethernet Interface Networking (As STA, Z-Ver)**

For above networking, USR-WIFI232-A/B/C module works as STA（Firmware is Z-Version）,and module configured as bridge mode. When module connect to AP, all devices connected to module Ethernet interface will get assigned IP address from AP (For example: 192.168.1.101).For module works as bridge mode, it can be treated as a transparent device and PC1, PC2 can communicate without any limit. But in this networking, USR-WIFI232-A/B/C module needs assign a static LAN IP address (For example: 192.168.1.10) if module also needs communication with AP or configuration through web page.

## 4.5 WI-FI parameter setting

### 4.5.1 Auto- Frequency Function

When module works as STA, USR-WIFI232-A/B/C will adjust its wireless channel to keep the same channel with associated AP and connect in.
When module works as AP and USR-WIFI232-A/B/C enable Auto-frequency function, then when module boot up, it will select the best wireless channel based on surrounding environment.

### 4.5.2 Security

USR-WIFI232-A/B/C module supports multiple wireless encryption mechanisms, and enables to protect the security of user's data transmission, the mechanisms include:

- WEP
- WPA-PSK/TKIP
- WPA-PSK/AES
- WPA2-PSK/TKIP
- WPA2-PSK/AES

### 4.5.3 Search Function for STA

When using web configuration STA Interface Setting Page, user can push “Search” button to find surrounding AP, and find a AP to associated.

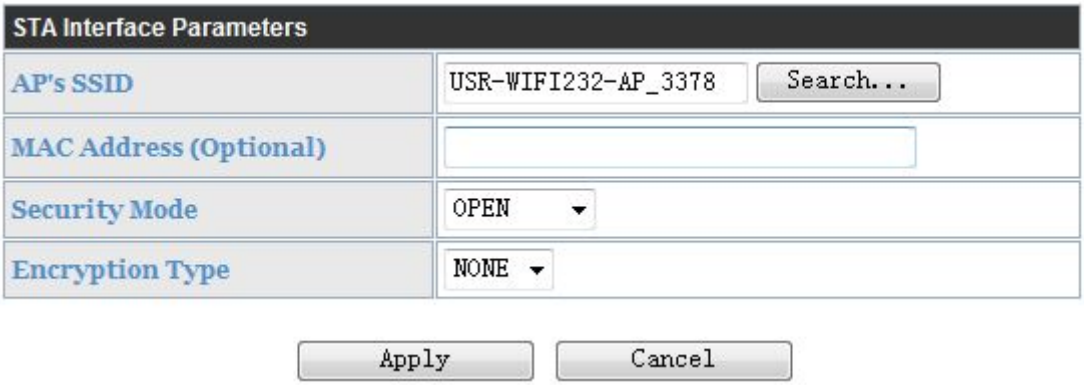



Figure 29 **Search page**

### 4.5.4 Address Binding

USR-WIFI232-A/B/C module supports the feature of binding the BSSID address of target network. According to the provisions of 802.11 protocol, different wireless networks can have a same network name (i.e. SSID / ESSID), but must correspond to a unique BSSID address (i.e. MAC address). Illegal intruders can create a wireless network with the same SSID / ESSID, it will make STAs in the network to join to the illegal AP, thereby and then network leakage happen.

Users can prevent STA from joining to illegal network by binding the BSSID address, to improve wireless network security.

## 4.6 UART Frame Scheme

### 4.6.1 UART Free-Frame

USR-WIFI232-A/B/C support UART free-frame function. If user select open this function, module will check the intervals between any two bytes when receiving UART data. If this interval time exceeds defined value (50ms default), USR-WIFI232-A/B/C will think it as the end of one frame and transfer this free-frame to WiFi port, or USR-WIFI232-A/B/C will receive UART data until 4K bytes, then transfer 4KB frame to WiFi port.

USR-WIFI232-A/B/C’s default interval time is 50ms. User can also set this interval to fast (10ms) through AT command. But user have to consider if user MCU can send UART data with 10ms interval ,or the UART data may be divide as fragment.

Through AT command: AT+FUARTTE=fast/normal, user can set the interval time: fast (10ms) and normal (50ms). This command is factory default setting command and AT+RELD can't change its value.

### 4.6.2 UART Auto-Frame

USR-WIFI232-A/B/C support UART auto-frame function. If user select open this function and setting auto-frame trigger length and auto-frame trigger time parameters, then module will auto framing the data which received from UART port and transmitting to the network as pre-defined data structure.

- **Auto-frame trigger length:** The fixed data length that module used to transmitting to the network.
- **Auto-frame trigger time:** After the trigger time, if UART port received data can't reach auto-frame trigger length, then module will transmitting available data to the network and bypass the auto-frame trigger length condition.

Detailed UART auto-frame function can refer to AT+ instruction set "UARTF/UARTFT/UARTFL" introduction.

## 4.7 Network Setting

USR-WIFI232-A/B/C module has two TCP/UDP Socket: Socket A and Socket B. Serial data written to the module, will be sent to the Socket A and B simultaneously; TCP/UDP data that module receives through either Socket A or B,will be sent to the serial port.
Dual Socket through different settings, you can achieve a variety of network interconnect. When the module shipped only open Socket A, Socket B default is not to connect, if the user needs to use, please set by AT commands.

### 4.7.1 Socket A

Socket A has three work mode: TCP Server, TCP Client, UDP.The setting method, please refer to the AT+NETP command instruction.
When Socket A configured as TCP Server, it supports Multi-TCP link connection, and maximum 32 TCP clients permitted to connect to Socket A.
Multi-TCP link connection will work as following structure:
Upstream: All dates from different TCP connection or client will be transmitted to the serial port as a sequence.
Downstream: All data from serial port (user) will be duplicate and broadcast to every TCP connection or client.
Detailed multi-TCP link data transmition structure as following figure:

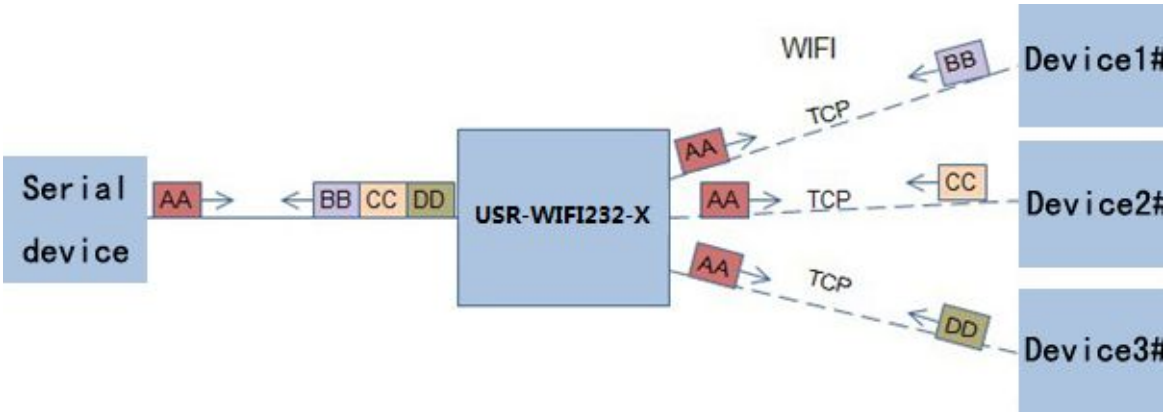



Figure 30 **Multi-TCP Link Data Transmition Structure**

### 4.7.2 Socket B

Socket B has one work mode: TCP Client, please refer to the AT + SOCKB command instruction. With variety work mode, socket B can provide users with flexible data transfer methods.For example, Socket B can connect to a remote server in order to achieve remote control.

## 4.8 New function

This chapter is based on the function of V4.02.10.USR13 and above, if not this version you can skip this section.

### 4.8.1 TCP password authentication

This feature is available only on the module as a TCP server, when the TCP client connection module, the module will authenticate each connected tcp.

Each TCP client first data is the “password+0x0d+0x0a” (the password is Webpage authentication password). The default password is “admin”, so the first piece of data should be "0x61 0x64 0x6D 0x69 0x6E 0x0D 0x0A" (Hex). If the password is correct, the module returns "OK", on the other hand, return to the "NO" and disconnect.

The TCP connection of this function can be Webpage in "TCP connection password authentication" is opened or disable. Please refer to the specific "5.1.2" section.

### 4.8.2 Upload ID

This function only applies to the module as a TCP client, in front of the data when module connected to the server with two bytes of ID (ID the range is 0 ~ 65535, the high byte before, and the low byte behind) plus two bytes ID radix-minus-one complement.Module is the default ID is 1111, for example, is sent to the server when the first four bytes "0x57 0x04 0xfb 0xa8".

There are two ways to upload their own id: one is to upload their own id for connection to the server for the first time;The other is a plus id in front of each data.

ID number related parameter is set in the "serial port and other Settings" section of the web, build joint function of ID for the first time, and each data with the function of ID are opened by default.

ID can also use the at command to set the related parameters, specific refer to 5.2.1.4.32-5.2.1.4.34 section.

### 4.8.3 Self-adaption Baudrate

This feature, please cooperate with our company's virtual serial port software use.
Use a serial port connected module, and use the at command "at + AABR = on" open this function and restart.In the USR - VOCM software "synchronous baud rate (RFC2217 similar)" is selected, the following figure.

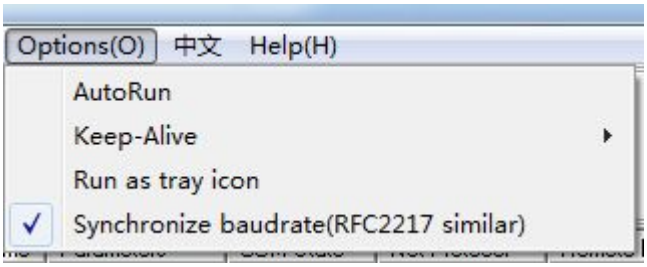



Figure 31 **RFC 2217**

In this way, the module of baud rate will be as the USR-VCOM to change at any time, and don't have to restart the module.If restart the module, baud rate and will come back to before.

### 4.8.4 WEB IO

This function only work for "GPIO2 mode".
When the module is in the "GPIO2 mode", enter the Webpage in "WEB IO", you can click on the corresponding button to control module pin level. Without the need to download and install app, any platform, any equipment, as long as you can into the built-in Webpage of module through the browser built-you can control module pin of IO.

### 4.8.5 Keepalive

V4.02.10. USR13 and above version of the firmware added keepalive when the TCP connection mechanism, so when the module of network anomalies, timely diagnose abnormal to the network and disconnect, when the network has resumed after, and just in time to connect to the server.

## 4.9 Palmodic Signal

Base on selected factory default setting, “nReady” signal can have two output statuses:

- ✧ Status One: The module will output “0” after normal boot up. This signal used to judge if module finish boot up and ready for application.
- ✧ Status Two: The module will output “Palmodic Signal” after normal boot up.The palmodic signal is 0.5Hz square wave with dutyfactor 1:1. User can query this signal to judge if moduleis active “live” or need to re-boot. When module switches to command mode, it will output “0”, which used to distinguish work mode and command mode.

Notes:

This function is user selected factory setting and RELD instruction will not effective for this function. If user not requires this function, the default factory setting is Status One. Contact with USR Technology for more detailed support.

## 4.10 Parameters Configuration

USR-WIFI232-A/B/C module supports two methods to configuration parameters: **Web Accessing** and **AT+instruction set.**

Web accessing means users can configure parameters through built-in webpage. When USR-WIFI232-A/B/C module connected to wireless network, parameters configuration is done on a PC connected to the same wireless network. AT+instruction set configuration means user configure parameters through serial interface command. Refer to “AT+instruction set” chapter for more detail.

**Notes:**

USR can customized the parameters setting as customer request and ship USR-WIFI232-A/B/C modules with these parameters as factory default configuration. It will reduce user’s module configuration time for mass production. Also, if user need different parameters setting for every module, USR can provide the auto-configuration tool to speed up the module configuration duration. Please contact USR technical interface to acquire this tool if required.

## 4.11 Firmware Upgrade

USR-WIFI232-A/B/C module supports firmware upgrade online.

# 5 Web Accessing and AT+instruction set

## 5.1 Configuration via Web Accessing

When first use USR-WIFI232-A/B/C modules, user may need some configuration. User can connect to USR-WIFI232-A/B/C module's wireless interface with following default setting information and configure the module through laptop.

Table 9 USR-WIFI232-A/B/C Web Access Default Setting

| Parameters | Default Setting |
|---|---|
| SSID | USR-WIFI232-AP_xxxx |
| IP Address | 10.10.100.254 |
| Subnet Mask | 255.255.255.0 |
| User Name | admin |
| Password | admin |

### 5.1.1 Open Web Management Interface

Step 1: Connect laptop to SSID "USR-WIFI232-AP_xxxx" of USR-WIFI232-A/B/C module via wireless LAN card;
Step 2: After wireless connection OK. Open Wen browser and access "**http://10.10.100.254**";
Step 3: Then input user name and password in the page as following and click "OK" button.

Connect to 10.10.10.254
The server 10.10.10.254 at GoAhead requires a username and password.
Warning: This server is requesting that your username and password be sent in an insecure manner (basic authentication without a secure connection).
User name:
admin
Password:
Remember my password
OK
Cancel

Figure 32 **Open Web Management page**

The USR-WIFI232-A/B/C web management page support English and Chinese language. User can select language environment at the top right corner and click "Apply" button.

The main menu include five pages: "Mode Selection"," AP Interface Setting","STA Interface Setting","Application Setting", "WEB IO"and "Device Management"

## 5.1.2 Mode Selection Page

This page use to setting the wireless networking mode (AP and STA mode).
"Data transmission mode" selection module working mode are "Transparent Mode", "Serial Command mode", "GPIO1 mode", "GPIO2 mode".
"TCP connection password authentication" can choose whether open TCP password authentication.

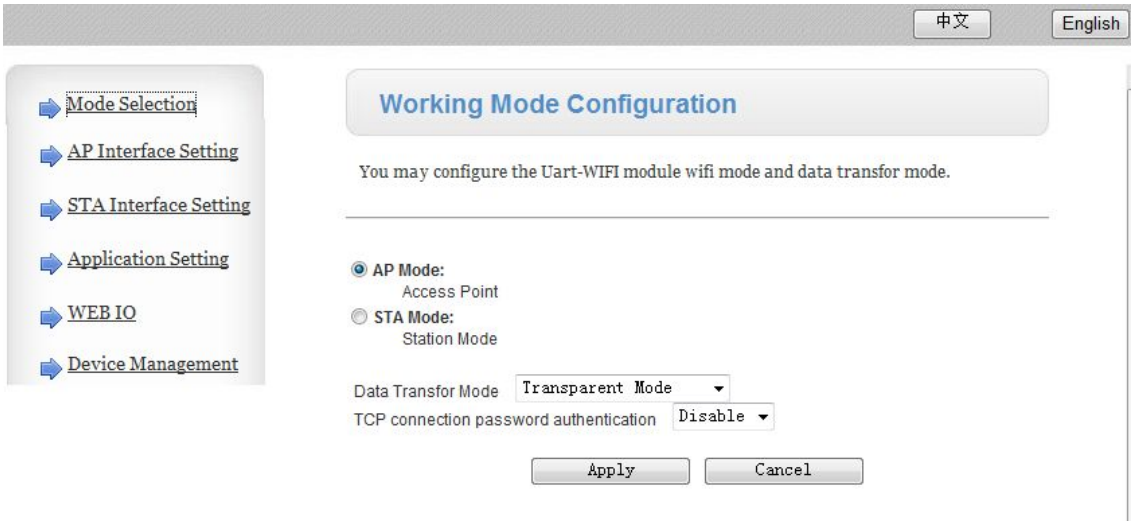



Figure 33 **Mode Selection Page**

## 5.1.3 AP Interface Setting Page

This page use to setting the parameters when USR-WIFI232-A/B/C module works as AP.

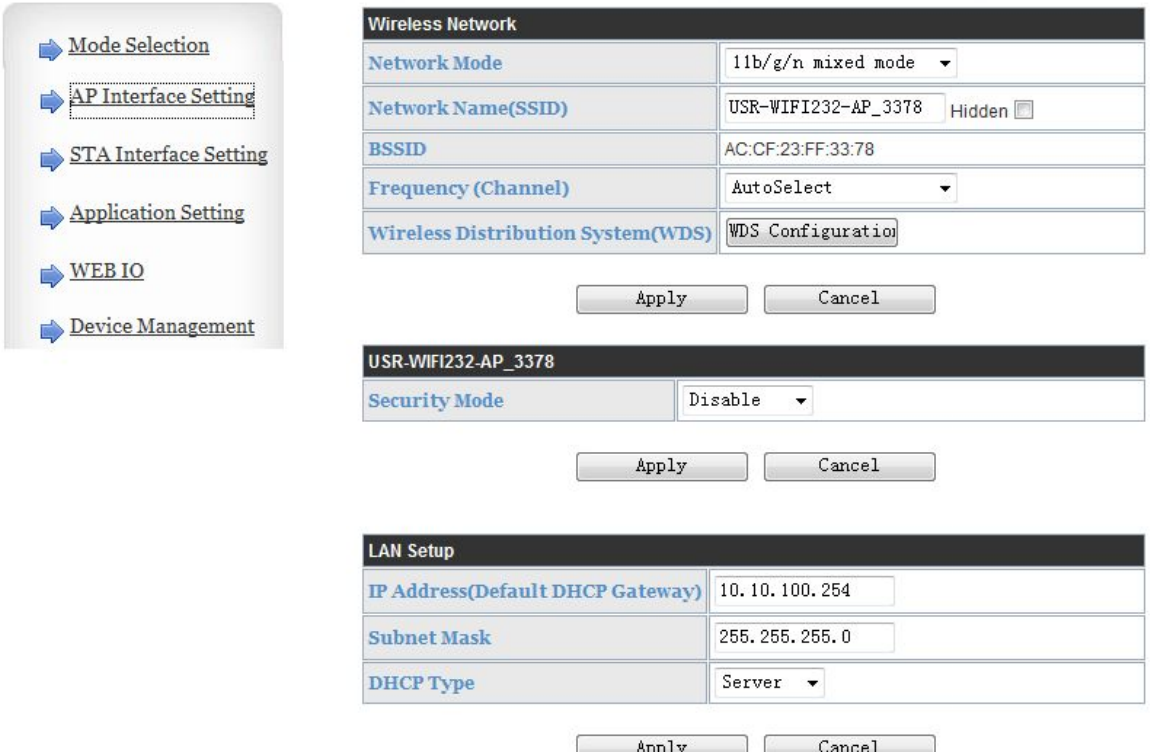



Figure 34 **AP Interface Setting Page**

## 5.1.4 STA Interface Setting Page

This page use to setting the parameters when USR-WIFI232-A/B/C module works as STA.
Such as SSID of AP which module need to connected, and also select the networking type: DHCP or static IP address.

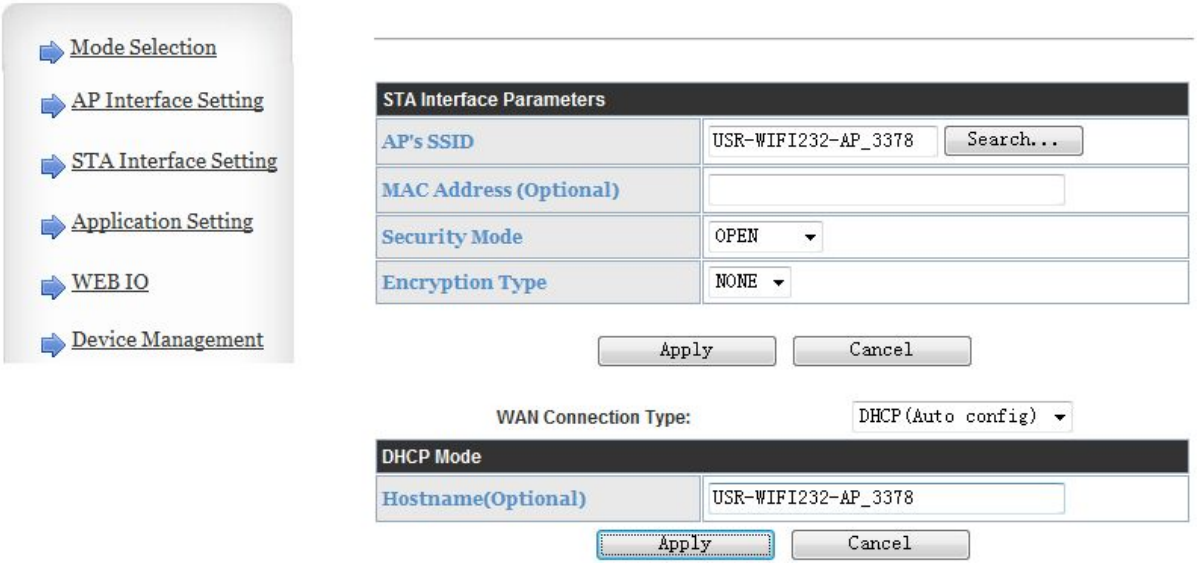
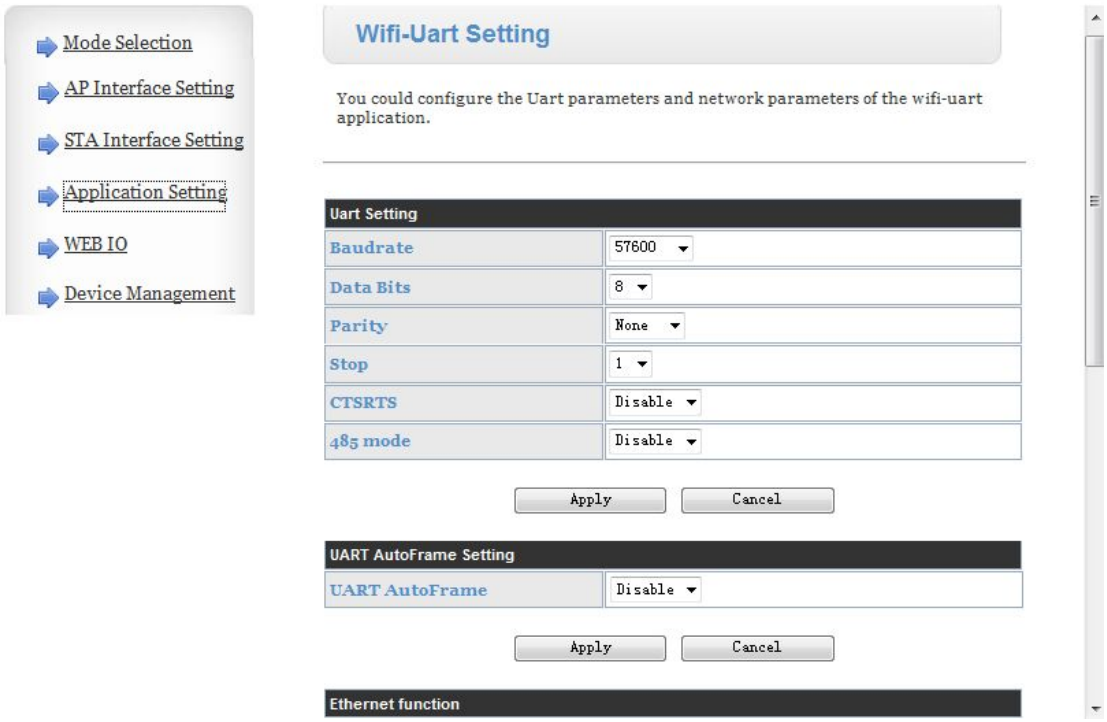



Figure 35 **STA Interface Setting Page**

## 5.1.5 Application Setting Page

This page use to setting the parameters of serial port communication, such as UART setting,UART AutoFrame Setting,Ethernet function,Device ID setting and high layer network protocol setting which used support serial communication.



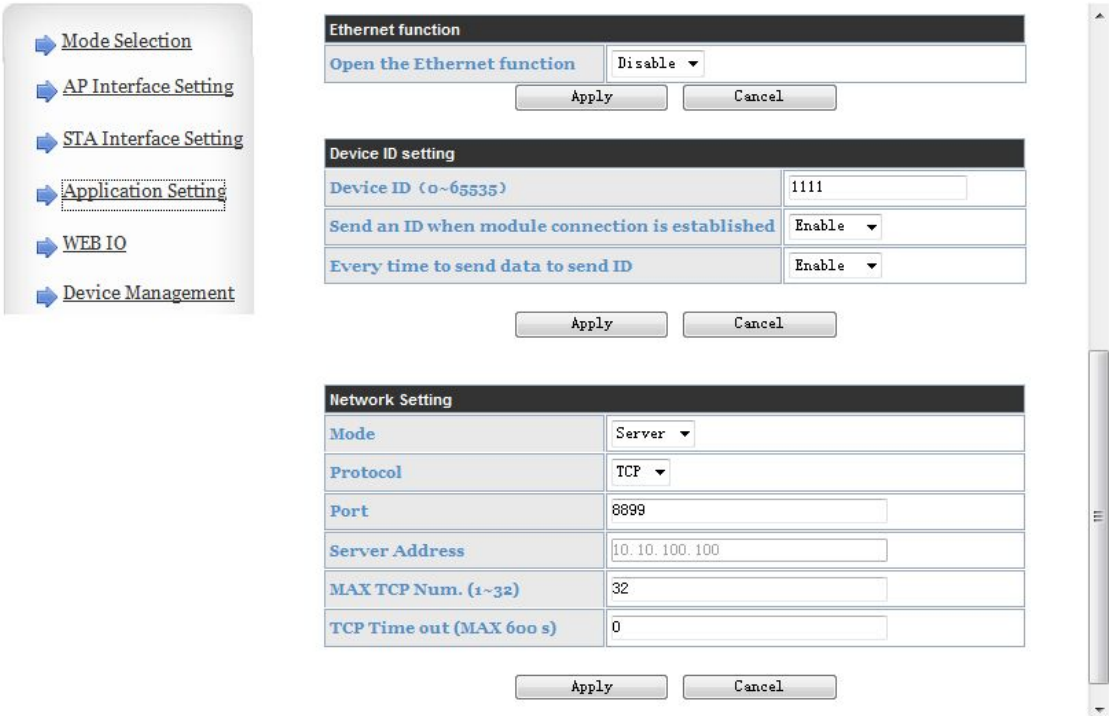



Figure 36 **Application Setting Page**

**Notes:**

Generally, Network protocols support three modes: **TCP Server**, **TCP Client**, **and UDP**. UDP has no server and client requirement according to standard.

Besides module working as TCP Server (IP address not required in this mode). User must set the IP address of the device which need communicate with USR-WIFI232-A/B/C module.
Also the Port ID between two sides of the communication devices must keep the same.

### 5.1.6 WEB IO

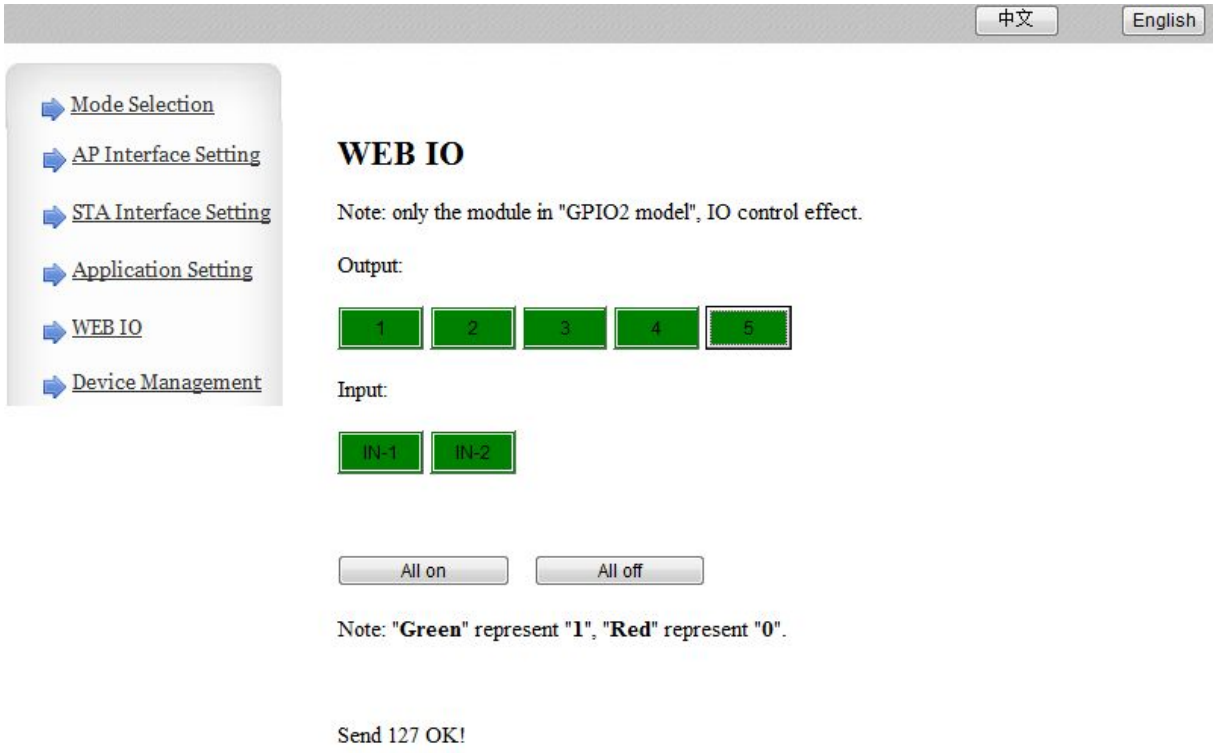



Figure 37 **WEB IO Page**

## 5.1.7 Device Management Page

This page use to manage USR-WIFI232-A/B/C module general setting, such as administrator setting, restart module button, restore factory default setting button, and update firmware through webpage.

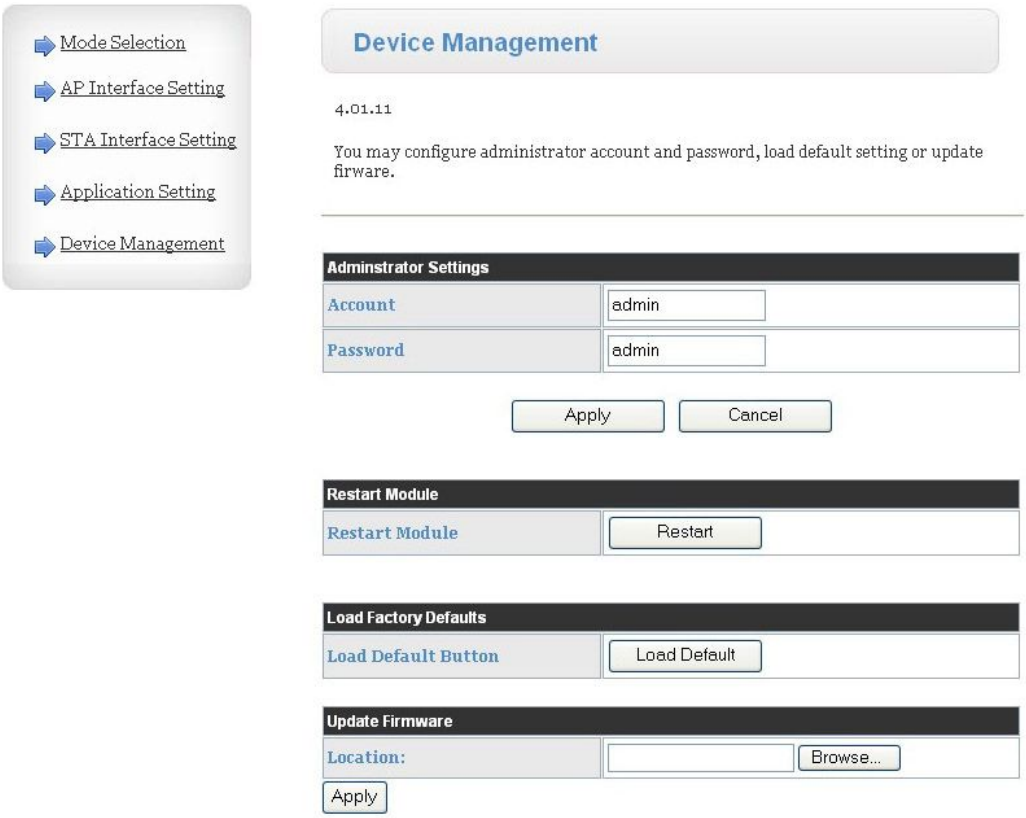



Figure 38 **Device Management Page**

**Notes:**

Figure 39Restart module button: When you setting the parameters of different web pages, you will click “Apply” button to confirm the setting, but the setting take effect only after user click the “Restart” button here, the module will re-boot up and refresh the memory information with new changes.

## 5.2 AT+instruction Introduction

### 5.2.1 Configuration Mode

When USR-WIFI232-A/B/C power up, it will default works as transparent transmission mode, then user can switch to configuration mode by serial port command. USR-WIFI232-A/B/C UART default parameters setting as below figure

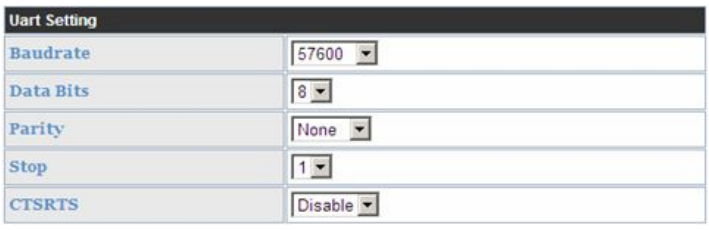



Figure 40 **USR-WIFI232-A/B/C Default UART Port Parameters**

In configuration mode, user can setting the module through AT+ instruction set, which cover all web page setting function.

#### 5.2.1.1 Switch to Configuration Mode

Two steps to finish switching from transparent transmission mode to configuration mode.

- **UART input "+++", after module receive "+++", and feedback "a" as confirmation.**
- **UART input "a", after module receive "a" and feedback "+ok" to go into AT+ instruction set configuration mode.**

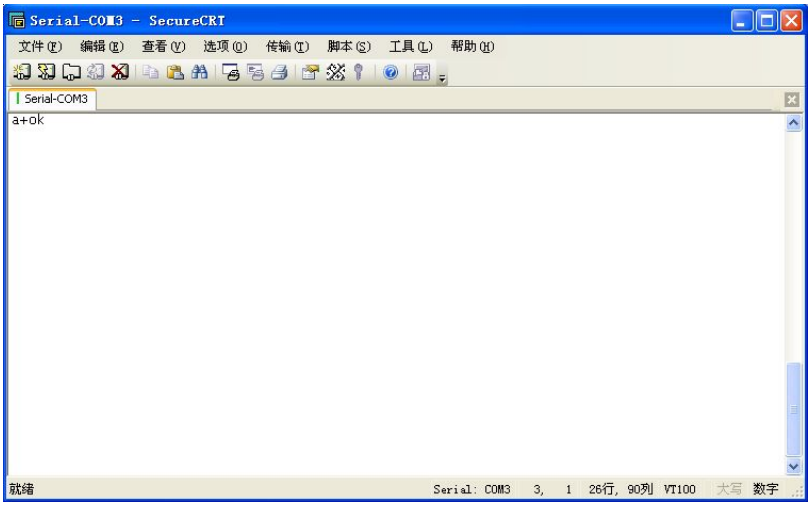
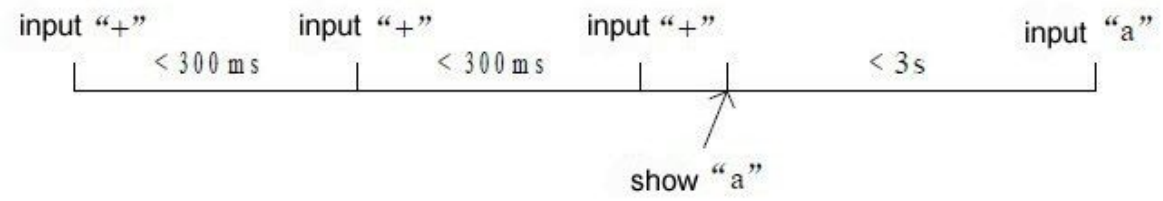



Figure 41 **Switch to Configuration Mode**

**Notes:**

1. When user input "+++" (No "Enter" key required), the UART port will display feedback information "a", and not display input information"+++" as above UART display.
2. Any other input or wro ng step to UART port will cause the module still works as original mode (transparent transmission).




### 5.2.2 AT+ Instruction Set Overview

User can input AT+ Instruction through hyper terminal or other serial debug terminal, also can program the AT+ Instruction to script. User can also input "AT+H" to list all AT+ Instruction and description to start.

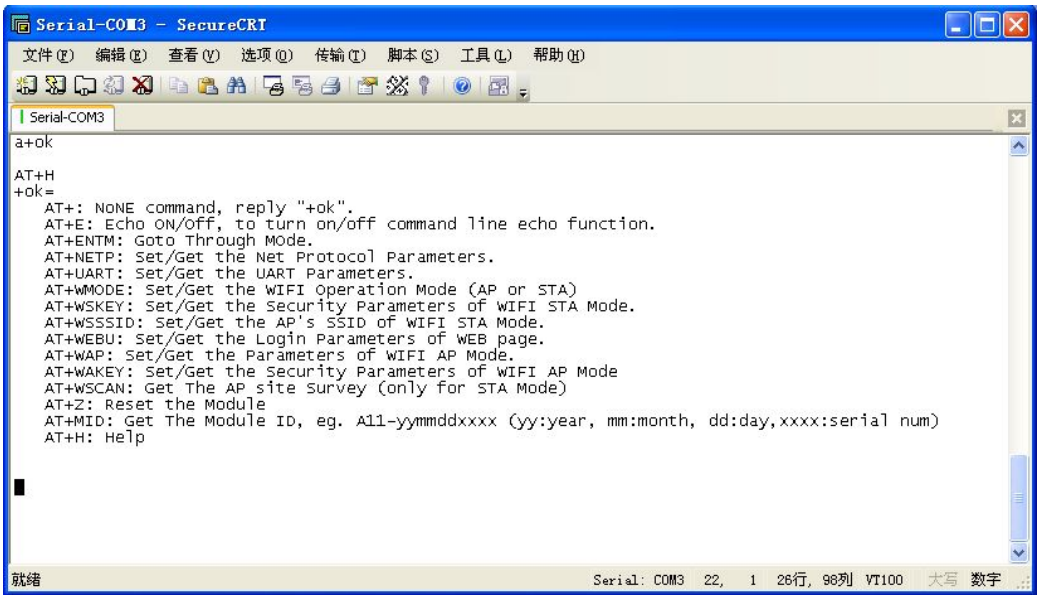

Serial-COM3 - SecureCRT
文件(F) 编辑(E) 查看(V) 选项(O) 传输(T) 脚本(S) 工具(L) 帮助(H)
Serial-COM3
a+ok
AT+H
+ok=
AT+: NoNE command, reply "+ok".
AT+E: Echo ON/Off, to turn on/off command line echo function.
AT+ENTM: Goto Through Mode.
AT+NETP: Set/Get the Net Protocol Parameters.
AT+UART: Set/Get the UART Parameters.
AT+WMODE: Set/Get the WIFI Operation Mode (AP or STA)
AT+WSKEY: Set/Get the Security Parameters of WIFI STA Mode.
AT+WSSSID: Set/Get the AP's SSID of WIFI STA Mode.
AT+WEBU: Set/Get the Login Parameters of WEB page.
AT+WAP: Set/Get the Parameters of WIFI AP Mode.
AT+WAKEY: Set/Get the Security Parameters of WIFI AP Mode
AT+WSCAN: Get The AP site Survey (only for STA Mode)
AT+Z: Reset the Module
AT+MID: Get The Module ID, eg. A11-yymmddxxxx (yy:year, mm:month, dd:day,xxxx:serial num)
AT+H: Help
就绪
Serial: COM3 22, 1 26行, 98列 VT100 大写 数字

Figure 42 **"AT+H" Instruction for Help**

We supply software USR-WIFI232-Setup to send command easily, software setup:

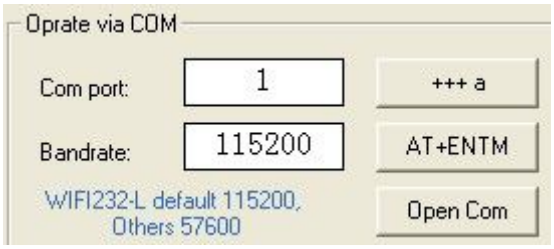



Figure 43 **Serial port parameter**

Click "Open Com", send "+++a", it will reply +ok in left side, then type in and send the command you need to send, then click "AT+RELD" to restore, then parameters saved.

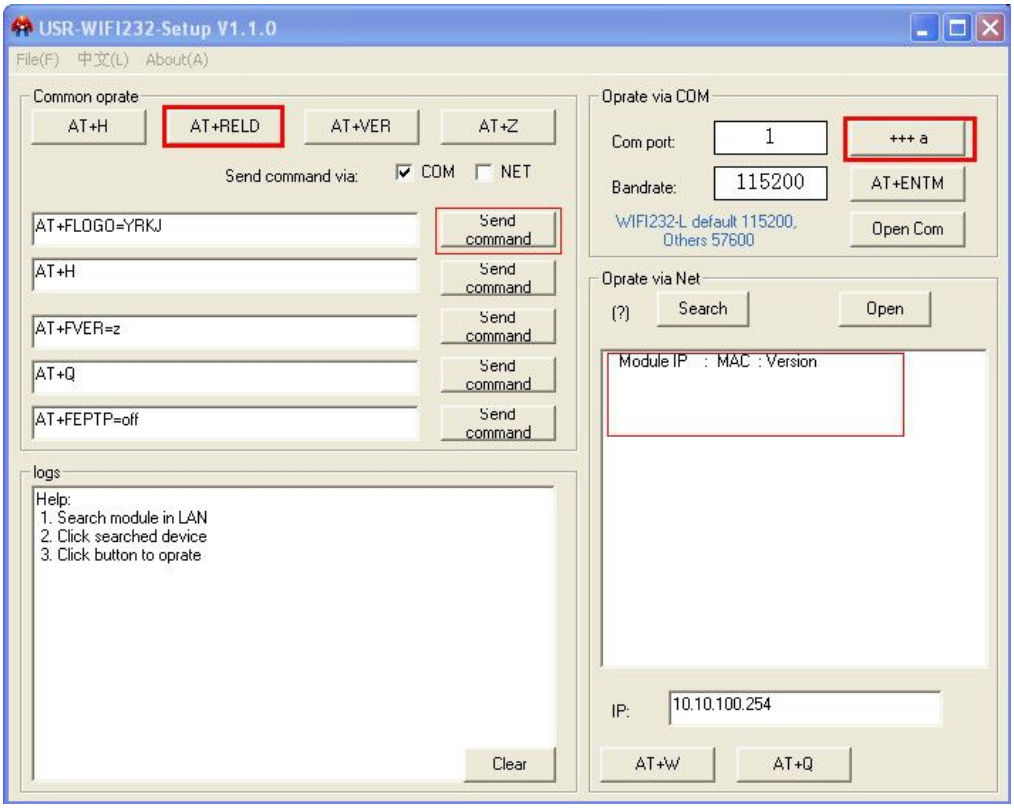



Figure 44 **software of USR-WIFI232-Setup**

Above is by COM, also you can send by WIFI:

First, connect with PC, open the software, see Net part

Figure 45 **Search module**

Click search, then will show module, click module then you can send command.

### 5.2.2.1 Instruction Syntax Format

AT+Instruction protocol is based on the instruction of ASCII command style, the description of syntax format as follow.

- **Format Description**
  - < >: Means the parts must be included
  - [ ]: Means the optional part

- **Command Message**

**AT+<CMD>[op][para-1,para-2,para-3,para-4…]<CR>**

- AT+: Prefix of command message;
- CMD: Command string;
- [op]: Symbol of command operator,
  - "=" : The command requires parameters input;
  - "NULL": Query the current command parameters setting;
- [para-n]: Parameters input for setting if required;

<CR>: "Enter" Key, it's 0x0a or 0x0d in ASCII;

**Notes**: When input AT+Instruction, "AT+<CMD>" character will display capital letter automatic and other parts will not change as you input.

➢ **Response Message**

**+<RSP>[op] [para-1,para-2,para-3,para-4…]<CR><LF><CR><LF>**

- +: Prefix of response message;
- RSP: Response string;
  - "ok" : Success
  - "ERR": Failure
- [op] : =
- [para-n]: Parameters if query command or Error code when error happened;
- <CR>: ASCII 0x0d;
- <LF>: ASCIII 0x0a;

➢ **Error Code**

Table 10 Error Code Description USR-WIFI232-A/B/C Web Access Default Setting

| Error Code | Description |
|---|---|
| -1 | Invalid Command Format |
| -2 | Invalid Command |
| -3 | Invalid Operation Symbol |
| -4 | Invalid Parameter |
| -5 | Operation Not Permitted |

### 5.2.2.2 AT+ Instruction Set

Table 11 AT+ Instruction Set List

| Instruction | Description |
|---|---|
| <null> | NULL |
| E | Open/Close show back function |
| ENTM | Set module into transparent transmission mode |
| NETP | Set/Query network protocol parameters |
| UART | Set/Query serial port parameters |
| UARTF | Open/Close UART auto-frame function |
| UARTFT | Set/Query UART auto-frame trigger time |

| | |
|---|---|
| UARTFL | Set/Query UART auto-frame trigger length |
| TMODE | Set/Query data transmission mode (transparent transmission or agreement transmission) |
| WMODE | Set/Query WIFI work mode (AP or STA) |
| WSKEY | Set/Query WIFI security parameters as STA |
| WSSSID | Set/Query WIFI target AP SSID parameters as STA |
| WSLK | Query WiFi link status as STA |
| WEBU | Set/Query WEB page login parameters (User Name and Password) |
| WAP | Set/Query WIFI parameters as AP |
| WAKEY | Set/Query WIFI security parameters as AP |
| HIDESSID | Set/Query hide AP's SSID |
| MSLP | Set modules into power save mode.(Turn OFF WiFi) |
| WSCAN | Seek AP when module works as STA mode |
| TCPLK | Query if TCP link already build-up |
| TCPDIS | Open/Cose TCP (Only TCP Client available) |
| WANN | Set/Query WAN setting, only effective as STA mode |
| LANN | Set/Query LAN setting, only effective as AP mode |
| DHCPDEN | Enable/Disable LAN DHCP server function |
| DHCPGW | Set/Query DHCP gateway address |
| TCPTO | Set/Query TCP timeout |
| MAXSK | Set/Query maxima TCP connection |
| TCPB | Open/Close TCPB function |
| TCPPTB | Set/Query TCPB port number |
| TCPADDB | Set/Query TCPB server address |
| TCPTOB | Set/Query TCPB time out time |
| TCPLKB | Query TCPB link status |
| EPHY | Open/Close ETH interface |
| STTC | Enable/Disable STA port scan function |
| DOMAIN | Set/Query domain of module webpage |
| FRLDEN | Enable/Disable nReload pin function |
| RELD | Restore to factory default setting |
| FUDLX | Open / close the 485 function |
| MMID | Device ID |
| IDFIR | Send an ID when module connection is established |
| IDEVE | Every time to send data to send ID |
| AABR | Open / close baud rate adaptive function |
| MID | Query module ID information |
| VER | Query module software version information |
| H | Help |

**Notes:** USR-WIFI232-A/B/C module can works as AP or STA, user have to use different AT+ Instruction to set WiFi parameters when module works as AP or STA mode.

#### 5.2.2.2.1 AT+E

- Function: Open/Close show back function;
- Format:

**AT+E<CR>**

**+ok<CR>< LF ><CR>< LF >**

When USR-WIFI232-A/B/C module firstly switch from transparent transmission to configuration mode, show back status is open, input “AT+E” to close show back function, input“AT+E” again to open show back function.

#### 5.2.2.2.2 AT+ENTM

- Function: Set module into transparent transmission mode;
- Format:

**AT+ENTM<CR>**
**+ok<CR>< LF ><CR>< LF >**

When operate this command, module switch from configuration mode to transparent transmission mode.

#### 5.2.2.2.3 AT+NETP

- Function: Set/Query network protocol parameters;
- Format:
  - Query Operation

**AT+NETP<CR>**
**+ok=<protocol,CS,port,IP><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+NETP=<protocol,CS,port,IP><CR>**
**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - protocol:
    - TCP
    - UDP
  - CS: Network mode:
    - SERVER
    - CLIENT
  - Port: protocol port ID: Decimal digit and less than 65535
  - IP: Server’s IP address when module set as client

After USR-WIFI232-A/B/C module boots up again, the setting will be effective.

#### 5.2.2.2.4 AT+UART

- Function: Set/Query serial port parameters;
- Format:
  - Query Operation

**AT+UART<CR>**
**+ok=<baudrate,data_bits,stop_bit,parity,flowctrl><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+UART=<baudrate,data_bits,stop_bit,parity,flowctrl><CR>**
**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - baudrate:

- ✧ 50,75,110,134,150,200,300,600,1200,1800,2400,4800,9600,19200,38400,57600,115200,230400,345600,460800
- ◆ data_bits:
  - ✧ 5,6,7,8
- ◆ stop_bits:
  - ✧ 1,2
- ◆ parity:
  - ✧ NONE,EVEN,ODD,MARK,SPACE
- ◆ flowctrl：hardware flow control (CTSRTS)
  - ✧ NFC: No flow control
  - ✧ FC: flow control

After USR-WIFI232-A/B/C module boots up again, the setting will be effective.

#### 5.2.2.2.5 AT+ UARTF

- ■ Function: Open/Close UART auto-frame function;
- ■ Format:
  - ◆ Query Operation

**AT+ UARTF<CR>**

**+ok=<para><CR>< LF ><CR>< LF >**

  - ◆ Set Operation

**AT+ UARTF=<para ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- ■ Parameters:
  - ◆ para:
    - ✧ disable - Close auto-frame function;
    - ✧ enable - Open auto-frame function;

#### 5.2.2.2.6 AT+ UARTFT

- ■ Function: Set/Query UART auto-frame trigger time;
- ■ Format:
  - ◆ Query Operation

**AT+ UARTFT<CR>**

**+ok=<time><CR>< LF ><CR>< LF >**

  - ◆ Set Operation

**AT+ UARTFT=<time ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- ■ Parameters:
  - ◆ time: Range 100 ~10000; Unit: ms. Auto-frame trigger time

#### 5.2.2.2.7 AT+ UARTFL

- ■ Function: Set/Query UART auto-frame trigger length;
- ■ Format:
  - ◆ Query Operation

**AT+ UARTFL<CR>**

**+ok=<len><CR>< LF ><CR>< LF >**

  - ◆ Set Operation

**AT+ UARTFL=<len ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - len: Range 64 ~4096; Unit: byte. Auto-frame trigger length;

#### 5.2.2.2.8 AT+TMODE

- Function: Set/Query data transmission mode;
- Format:
  - Query Operation

**AT+TMODE<CR>**

**+ok=<tmode><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ TMODE=<tmode><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - tmode: Data transmission mode
    - Through: Transparent transmission
    - Agreement: Agreement transmission

After USR-WIFI232-A/B/C module boots up again, the setting will be effective.

#### 5.2.2.2.9 AT+WMODE

- Function: Set/Query WIFI work mode;
- Format:
  - Query Operation

**AT+WMODE<CR>**

**+ok=<mode><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ WMODE=<mode><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - mode:WIFI work mode
    - AP
    - STA

After USR-WIFI232-A/B/C module boots up again, the setting will be effective.

#### 5.2.2.2.10 AT+WSKEY

- Function: Set/Query WIFI security parameters as STA;
- Format:
  - Query Operation

**AT+WSKEY<CR>**

**+ok=<auth,encry,key><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ WSKEY=< auth,encry,key><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - auth: Authentication mode
    - OPEN

- ✧ SHARED
- ✧ WPAPSK

◆ encry:Encryption algorithm

- ✧ NONE: When “auth=OPEN”, effective
- ✧ WEP: When “auth=OPEN” or “SHARED”, effective
- ✧ TKIP: When ”auth= WPAPSK”, effective
- ✧ AES: When “auth= WPAPSK”, effective

◆ key: password, ASCII code, shall less than 64 bit and greater than 8bit

This Instruction only effective for USR-WIFI232-A/B/C works as STA. After USR-WIFI232-A/B/C module boots up again, the setting will be effective. But user can set this command when module configured as AP.

#### 5.2.2.2.11 AT+WSSSID

■ Function: Set/Query WIFI target AP SSID parameters as STA.

■ Format:

◆ Query Operation

**AT+WSSSID<CR>**

**+ok=<ap’s ssid><CR>< LF ><CR>< LF >**

◆ Set Operation

**AT+ WSSSID=<ap’s ssid ><CR>**

**+ok<CR>< LF ><CR>< LF >**

■ Parameters:

◆ ap’s ssid: AP’s SSID

This Instruction only effective for USR-WIFI232-A/B/C works as STA. After USR-WIFI232-A/B/C module boots up again, the setting will be effective. But user can set this command when module configured as AP.

#### 5.2.2.2.12 AT+ WSLK

■ Function: Query WiFi link status as STA

■ Format:

◆ Query Operation

**AT+ WSLK<CR>**

**+ok=<ret><CR>< LF ><CR>< LF >**

■ Parameters:

◆ ret

- ✧ ”Disconnected”, if no WiFi connection;
- ✧ ”AP’ SSID（AP’s MAC”）, if WiFi connection available;
- ✧ ”RF Off”, if WiFi OFF;

This Instruction only effective for USR-WIFI232-A/B/C works as STA. After USR-WIFI232-A/B/C module boots up again, the setting will be effective. But user can set this command when module configured as AP.

#### 5.2.2.2.13 AT+WEBU

■ Function: Set/Query WEB page login parameters;

■ Format:

◆ Query Operation

**AT+WEBU<CR>**

**+ok=<usr,password><CR>< LF ><CR>< LF >**

- Set Operation

**AT+ WEBU=< usr,password ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - usr: User name for WEB page access;
  - password：Password for WEB page access;

#### 5.2.2.2.14 AT+WAP

- Function: Set/Query WIFI parameters as AP;
- Format:
  - Query Operation

**AT+WAP<CR>**

**+ok=<wifi_mode,ssid,channel><CR>< LF ><CR>< LF >**

- Set Operation

**AT+ WAP=<wifi_mode,ssid,channel><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - wifi_mode: WiFi protocols
    - 11BG
    - 11B
    - 11G
    - 11BGN
    - 11N
  - ssid: SSID when module works as AP;
  - channel: WIFI channel selection
    - AUTO
    - CH1~CH11

This Instruction only effective for USR-WIFI232-A/B/C works as AP. After USR-WIFI232-A/B/C module boots up again, the setting will be effective. But user can set this command when module configured as STA.

#### 5.2.2.2.15 AT+WAKEY

- Function: Set/Query WIFI security parameters as AP;
- Format:
  - Query Operation

**AT+WAKEY<CR>**

**+ok=<auth,encry,key><CR>< LF ><CR>< LF >**

- Set Operation

**AT+ WAKEY=< auth,encry,key><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - auth: Authentication mode
    - OPEN
    - SHARED

- WPAPSK
- encry:Encryption algorithm
  - NONE: When “auth=OPEN”, effective;
  - WEP: When “auth=OPEN”, effective or “SHARED”, effective;
  - TKIP: When “auth=WPAPSK”, effective;
  - AES:When “auth=WPAPSK”, effective;
  - TKIPAES:When “auth=WPAPSK”, effective;
- key: password, ASCII code, shall less than 64 bit and greater than 8bit;

This Instruction only effective for USR-WIFI232-A/B/C works as AP. After USR-WIFI232-A/B/C module boots up again, the setting will be effective. But user can set this command when module configured as STA.

#### 5.2.2.2.16 AT+HIDESSID

- Function: Set/Query hide AP’s SSID;
- Format:
  - Query Operation

**AT+HIDSSID<CR>**

**+ok=<sta.><CR><LF><CR><LF>**

  - Set Operation

**AT+HIDSSID=<sta><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - When Query,sta reply if module’s SSID is hide;
    - On-not hide SSID
    - Off- hide SSID
  - When Set,
    - Off-hide SSID
    - On- not hide SSID

#### 5.2.2.2.17 AT+MSLP

- Function: Set modules into power save mode.(Turn OFF WiFi);
- Format:
  - Query Operation

**AT+ MSLP <CR>**

**+ok=<sta.><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ MSLP=<on/off><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - When Query,sta reply if the module in sleep mode;
    - On - Module not in sleep mode (WiFi ON);
    - Off - Module in sleep mode(WiFi OFF);
  - When Set,
    - Off - Set module to sleep mode (WiFi OFF);

- ✧ On - Set module to normal mode (WiFi ON);

When module go into sleep mode, user can input “AT+MSLP=on” to re-start the module and module go into transparent transmission mode.

#### 5.2.2.2.18 AT+WSCAN

- Function: Seek AP when module works as STA mode;
- Format:

**AT+ WSCAN<CR>**

**+ok=<ap_site><CR>< LF ><CR>< LF >**

- Parameters:
  - ap_site: AP searched;

#### 5.2.2.2.19 AT+ TCPLK

- Function: Query if TCP link already build-up;
- Format:

**AT+ TCPLK<CR>**

**+ok=<sta><CR>< LF ><CR>< LF >**

- Parameters:
  - sta.: if module already setup TCP link;
    - ✧ on: TCP link setup;
    - ✧ off: TCP link not setup;

#### 5.2.2.2.20 AT + TCPDIS

- Function: Open/Cose TCP (Only TCP Client available);
- Format:
  - Query Operation

**AT+TCPDIS<CR>**

**+ok=<sta><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ TCPDIS=<on/off><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - sta.: set/query TCP link status;
    - ✧ on: TCP link available; When setting “on”, module will connect to TCP server right away.
    - ✧ off: TCP link not available; when setting “off”, module will disconnect with TCP server and not connect again.

#### 5.2.2.2.21 AT+ WANN

- Function: Set/Query WAN setting, only effective as STA mode;
- Format:
  - Query Operation

**AT+WANN<CR>**

**+ok=<mode,address,mask,gateway><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ WANN=< mode,address,mask,gateway ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:

- mode: IP setting for WAN port
  - static: Static IP
  - DHCP: Dynamic IP
- address: WAN port IP address;
- mask: WAN port subnet mask;
- gateway: WAN port gateway address;

This Instruction only effective for USR-WIFI232-A/B/C works as STA. After USR-WIFI232-A/B/C module boots up again, the setting will be effective. But user can set this command when module configured as AP.

#### 5.2.2.2.22 AT+ LANN

- Function: Set/Query LAN setting, only effective as AP mode;
- Format:
  - Query Operation

**AT+LANN<CR>**

**+ok=<address,mask ><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ LANN=<address,mask ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - address: LAN port IP address;
  - mask: LAN port subnet mask;

This Instruction only effective for USR-WIFI232-A/B/C works as AP. After USR-WIFI232-A/B/C module boots up again, the setting will be effective. But user can set this command when module configured as STA.

#### 5.2.2.2.23 AT+DHCPDEN

- Function: Enable/Disable LAN DHCP server function;
- Format:
  - Query Operation

**AT+DHCPDEN<CR>**

**+ok=<sta><CR><LF><CR><LF>**

  - Set Operation

**AT+DHCPDEN=<sta><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - sta. If Enable/Disable LAN DHCP server function;
    - on: Enable LAN DHCP function
    - off: Disable LAN DHCP function

#### 5.2.2.2.24 AT+ DHCPGW

- Function: Set/Query DHCP gateway address;
- Format:
  - Query Operation

**AT+ DHCPGW<CR>**

**+ok=<address><CR>< LF ><CR>< LF >**

- Set Operation

**AT+ DHCPGW=<address ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - address: DHCP gate address;

#### 5.2.2.2.25 AT+ TCPTO

- Function: Set/Query TCP timeout;
- Format:
  - Query Operation

**AT+ TCPTO<CR>**

**+ok=<time><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ TCPTO=<time ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - time: TCP timeout time.
    - <= 600, (600s);
    - >=0, (0 means no timeout);
    - Default, 300s;

#### 5.2.2.2.26 AT+ MAXSK

- Function: Set/Query maxima TCP connection;
- Format:
  - Query Operation

**AT+ MAXSK<CR>**

**+ok=<num><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ MAXSK =<num ><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - num: 1~32, default 32. maxima TCP connection;

When configure as TCP/Server, USR-WIFI232-A/B/C support maxima 32 TCP connections. If not require so much connection, user can resetting this parameters.

#### 5.2.2.2.27 AT+TCPB

- Function: Open/Close TCPB function;
- Format:
  - Query Operation

**AT+TCPB<CR>**

**+ok=<sta><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ TCPB=<on/off><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:

- sta: TCPB enable status
  - on, TCPB enable
  - off, TCPB disable

After USR-WIFI232-A/B/C module boots up again, the setting will be effective.

#### 5.2.2.2.28 AT+TCPPTB

- Function: Set/Query TCPB port number;
- Format:
  - Query Operation

**AT+TCPPTB<CR>**

**+ok=<port><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ TCPB=<port><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - port: decimal ,<65535

After USR-WIFI232-A/B/C module boots up again, the setting will be effective.

#### 5.2.2.2.29 AT+TCPADDB

- Function: Set/Query TCPB server address;
- Format:
  - Query Operation

**AT+TCPADDB<CR>**

**+ok=<add><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ TCPADDB=<add><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - add: TCPB server address, can be IP address or url.

After USR-WIFI232-A/B/C module boots up again, the setting will be effective

#### 5.2.2.2.30 AT+TCPTOB

- Function: Set/Query TCPB time out time;
- Format:
  - Query Operation

**AT+TCPTOB<CR>**

**+ok=<time><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ TCPTOB=<time><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - time: TCPB time out time, <=600 (600s), >=0 (No time out), default 300

After USR-WIFI232-A/B/C module boots up again, the setting will be effective.

#### 5.2.2.2.31 AT+TCPLKB

- Function: Query TCPB link status;
- Format:

**AT+TCPCKB<CR>**

**+ok=<sta><CR>< LF ><CR>< LF >**

- Parameters:
  - sta: TCPB link status
    - on, TCPB link OK
    - off, TCPB link not available

#### 5.2.2.2.32 AT+EPHY

- Function: Open/Close ETH interface;
- Format:
  - Set Operation

**AT+ EPHY=<on/off><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - On/off
    - Off: Close Ethernet port function;
    - On: Open Ethernet port function;

If you want to keep the Ethernet port open,please use the AT+FEPHY=on.

Close module's Ethernet port function can reduce the power consumption. The default setting for USR-WIFI232-A/B/C is close Ethernet port function.

#### 5.2.2.2.33 AT+STTC

- Function: Enable/Disable STA port scan function
- Format:
  - Query Operation

**AT+STTC<CR>**

**+ok=<sta><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+STTC=<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - Sta: when query, this value feedback
    - On: Enable STA port scan function
    - Off: Disable STA port scan function

#### 5.2.2.2.34 AT+DOMAIN

- Function: Set/Query domain of module webpage;
- Format
  - Query Operation

**AT+DOMAIN<CR>**

**+ok=<domian><CR><LF><CR><LF>**

  - Set Operation

**AT+DOMAIN=<domain><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - domain: domain to access to module webpage

#### 5.2.2.2.35 AT+FRLDEN

- Function: Enable/Disable nReload pin function;
- Format:
  - Query Operation

**AT+FRLDEN<CR>**

**+ok=<on/off><CR><LF><CR><LF>**

  - Set Operation

**AT+FRELDEN=<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - On/off: Enable or Disable nReload pin function
    - On, enable nReload pin function;
    - Off, disable nReload pin function;

Notes: AT+FRLDEN is F-Setting, means restore to factory setting will not affect this command.

#### 5.2.2.2.36 AT+FUDLX

- Function: Enable/Disable 485 function;
- Format:
  - Query Operation

**AT+FUDLX<CR>**

**+ok=<on/off><CR><LF><CR><LF>**

  - Set Operation

**AT+FUDLX=<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - On/off: Enable or Disable 485 function
    - On, enable 485 function;
    - Off, disable 485 function;

Notes: AT+FUDLX is F-Setting, means restore to factory setting will not affect this command.

#### 5.2.2.2.37 AT+MMID

- Function: Set/Query Device ID;
- Format:
  - Query Operation

**AT+MMID<CR>**

**+ok=<time><CR>< LF ><CR>< LF >**

  - Set Operation

**AT+ MMID=<time><CR>**

**+ok<CR>< LF ><CR>< LF >**

- Parameters:
  - ID: device id(0~65535)

After USR-WIFI232-A/B/C module boots up again, the setting will be effective.

#### 5.2.2.2.38 AT+IDFIR

- Function: Enable/Disable “Send an ID when module connection is established” function;

- Format:
  - Query Operation

**AT+IDFIR<CR>**

**+ok=<on/off><CR><LF><CR><LF>**

  - Set Operation

**AT+IDFIR=<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - On/off: Enable or Disable “Send an ID when module connection is established” function
    - On, enable “Send an ID when module connection is established” function;
    - Off, disable “Send an ID when module connection is established” function;

#### 5.2.2.2.39 AT+IDEVE

- Function: Enable/Disable Every time to send data to send ID function;
- Format:
  - Query Operation

**AT+IDEVE<CR>**

**+ok=<on/off><CR><LF><CR><LF>**

  - Set Operation

**AT+IDEVE=<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - On/off: Enable or Disable Every time to send data to send ID function
    - On, enable Every time to send data to send ID function;
    - Off, disable Every time to send data to send ID function;

#### 5.2.2.2.40 AT+AABR

- Function: Enable/Disable Self-adaption Baudrate function;
- Format:
  - Query Operation

**AT+AABR<CR>**

**+ok=<on/off><CR><LF><CR><LF>**

  - Set Operation

**AT+AABR=<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - On/off: Enable or Disable 485 function
    - On, enable 485 function;
    - Off, disable 485 function;

#### 5.2.2.2.41 AT+RELD

- Function: Restore to factory default setting;
- Format:

**AT+ RELD<CR>**

**+ok=rebooting…<CR>< LF ><CR>< LF >**

This command restores the module to factory default setting, and then re-starts the module.

#### 5.2.2.2.42 AT+Z

- Function: Re-start module;
- Format:

**AT+ Z<CR>**

#### 5.2.2.2.43 AT+MID

- Function: Query module ID information;
- Format:
  - Query Operation

**AT+MID<CR>**

**+ok=<module_id><CR>< LF ><CR>< LF >**

- Parameters:
  - module_id: MID information;
    - A11-yymmddnnnn “yymmdd” date; “nnnn” serial number;

#### 5.2.2.2.44 AT+VER

- Function: Query module software version information;
- Format:
  - Query Operation

**AT+VER<CR>**

**+ok=<ver><CR>< LF ><CR>< LF >**

- Parameters:
  - ver: Module software version information;

#### 5.2.2.2.45 AT+H

- Function: Help;
- Format:
  - Query Operation

**AT+H<CR>**

**+ok=<command help><CR>< LF ><CR>< LF >**

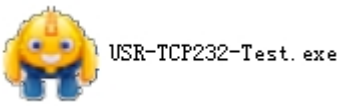
- Parameters:
  - command help: command introduction;

# 6 USR-WIFI232-A/B/C Usage Introduction

## 6.1 Module Debug

### 6.1.1 Software Debug Tools

In order to facilitate the use of my company, development of the serial and network debugging two-in-one test software, USR-TCP232-Test




## 6.1.2 Network Connection

In order to test the serial port to the WIFI network address conversion, we will module serial connected with the computer, network and computer links to WIFI.

Due to the need to have both a WIFI and serial special requirements, only a minority of the notebook computer can achieve, the user can use the desktop with a USB card, or use the notebook computer with a USB to serial line way, the author uses the desktop and WIFI card form test, desktop with serial. ( Note: there USB transfer RS232 the line quality uneven, some good and some bad, in order not to waste your valuable time, look for buying a used FT232 chip scheme suggested switching line, about the price $10)

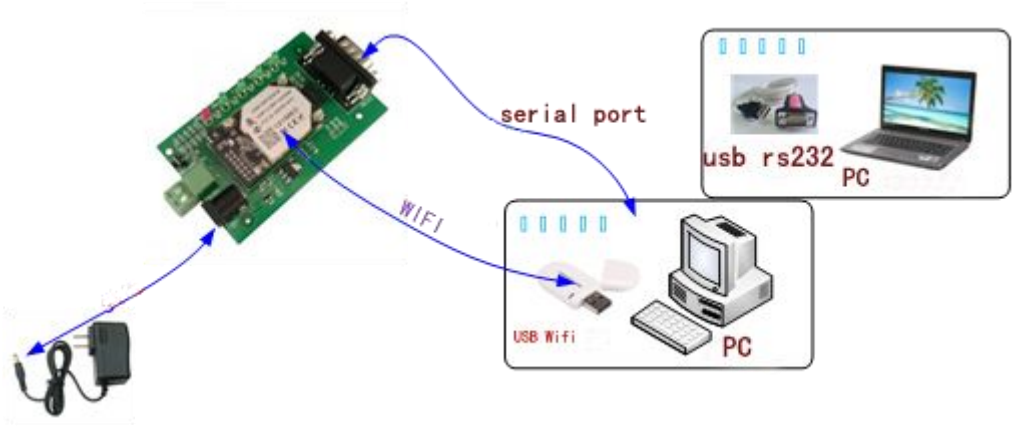



Figure 46 **Connection diagram**

On the serial connection, module pin leads to 3.3V TTL level, not directly connected with the computer, need to bring the bottom or users are TTL to RS232 connecting line connected to the computer, in order to facilitate the user to test the use of, we provide a variety of floor for the user to choose, here in the case of USR-WIFI232-2.

Hardware connectivity, for module power supply, the red power indicator light, wait about 6 seconds ( internal system boot ), Ready lights, said system startup complete, can operate, entering the next step.

## 6.1.3 Debug

As shown above, opened in PC program, set the COM export and open the serial port connection

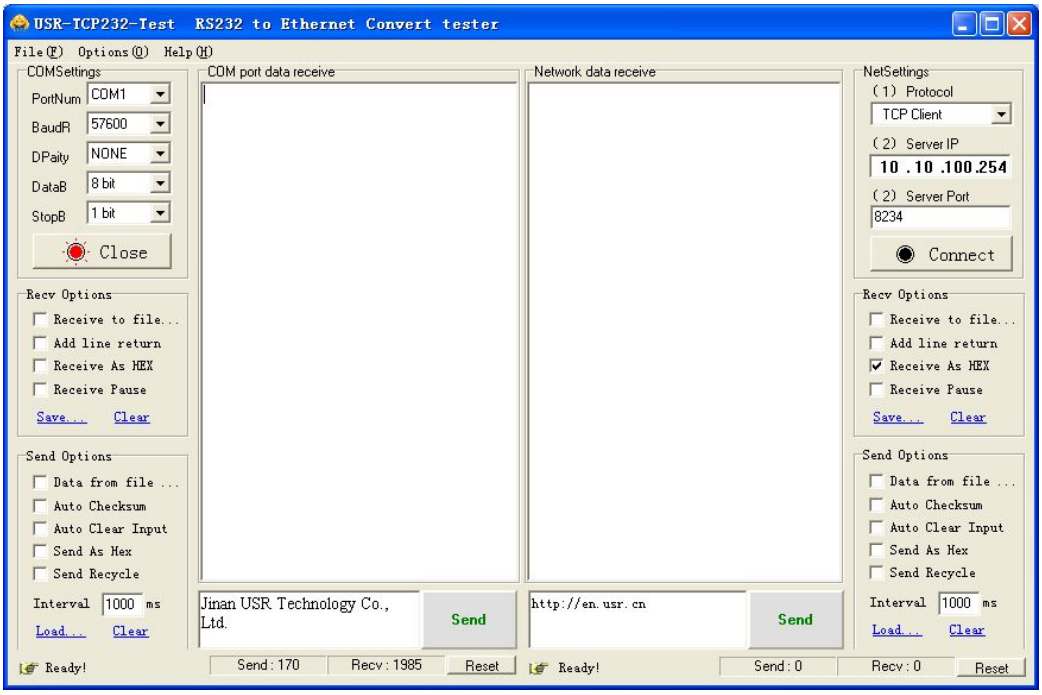



Figure 47 **"CommTools" Serial Debug Tools**

Open test software USR-TCP232-Test.exe, selection of hardware attached to the computer's serial number, this is COM1, choose 57600 baud rate, such as the WIFI module serial default baud rate, open the serial port.

Network settings in TCP client mode, the server IP address input 10.10.100.254, this is WIFI module default IP address, server port number 8899, this module default monitor TCP port number, click the link to establish TCP connection,Then click the create connection.

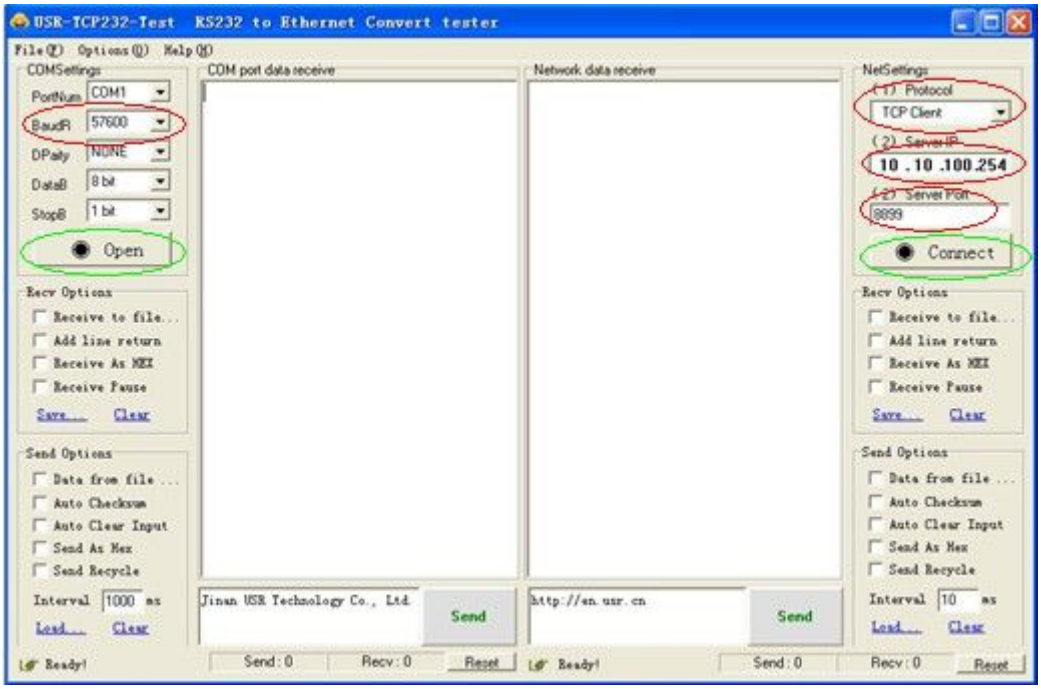



Figure 48 **"TCP UDPDbg" Tools Create Connection**

Because of the USR-WIFI232-A/B/C module default support for transparent transmission mode, so now you can debug tools two-way data, all data will be wholly intact transmission to the other side of display. The testing process can be seen in module TXD and RXD indicator lights in the data through the flashing.

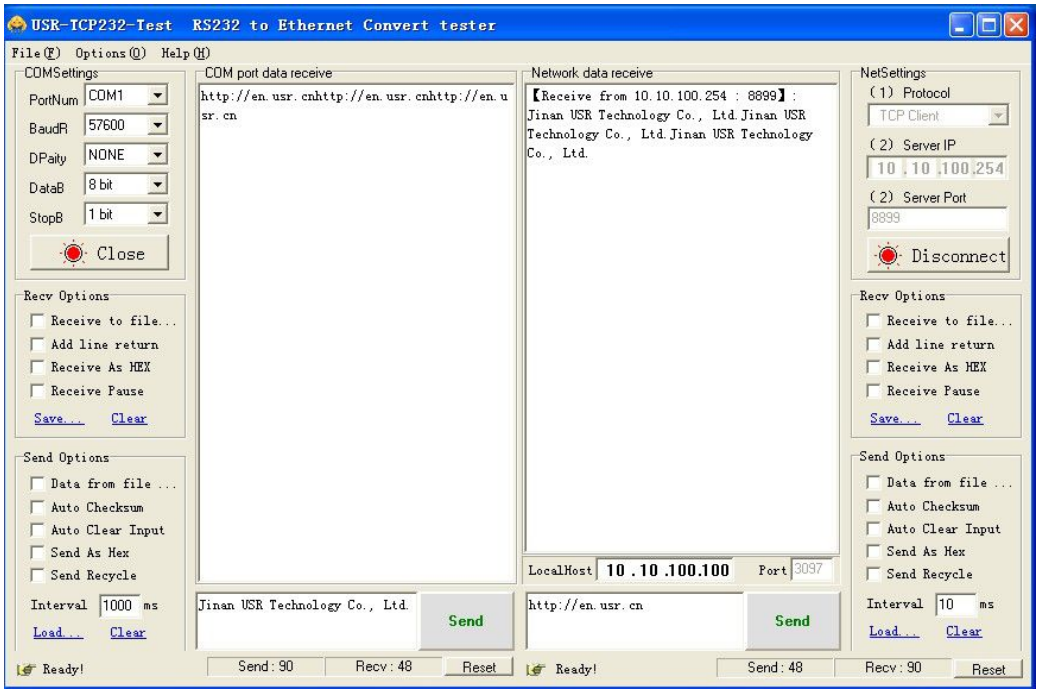



Figure 49 **The test results show that the network and serial port**

**Note**: because of the RTS/CTS pin processing difference, currently available on the part of the serial debugging software for the module of the system is not available, please be sure to want to use USR-TCP232-Test we provide testing, or just RXD TXD GND connected the three line to the computer, please notice.

## 6.2 Use Cases

### 6.2.1 Wireless Control Application

Figure 50 **Wireless Control Application**

For this wireless control application, USR-WIFI232-A/B/C works as AP mode. Module's serial port connects to user device. So, control agent (Smart phone for this example) can manage and control the user device through the wireless connection with USR-WIFI232-A/B/C module.

## 6.2.2 Remote Management Application

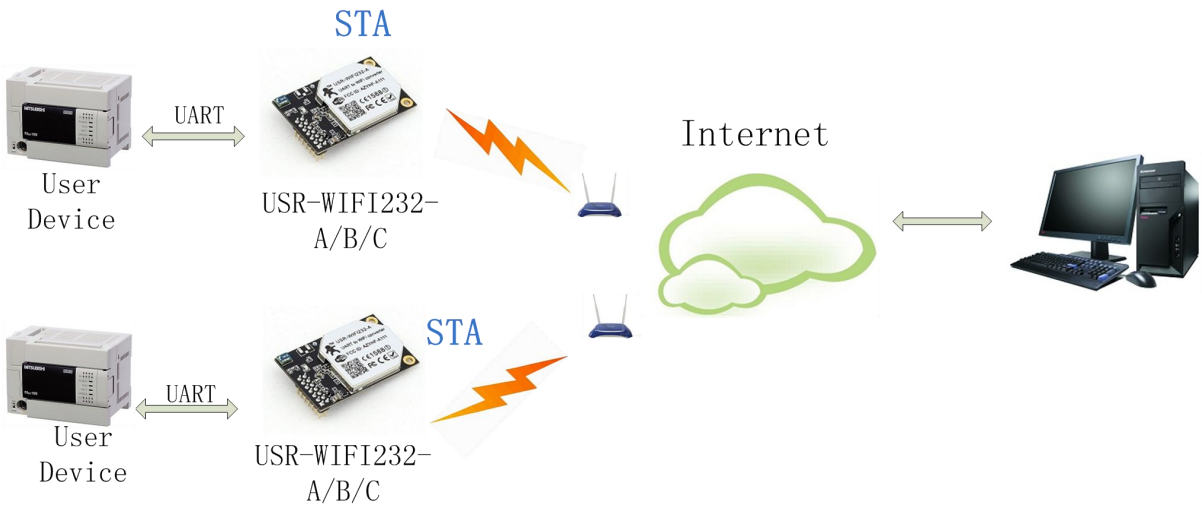



Figure 51 **Remote Management Application**

For this remote management application, USR-WIFI232-A/B/C works as STA mode and connects to Internet through wireless AP. Module configured as TCP Client and communicates with remote TCP server at Internet. Module's serial port connects to user device.

So, user device's data or sampling information can send to remote TCP server for storage or processing. Also remote TCP server can send command to control and manage the user device through the wireless network.

## 6.2.3 Transparent Serial Port Application

For this transparent serial port application, two USR-WIFI232-A/B/C modules connect as below figures to build up a transparent serial port connection.

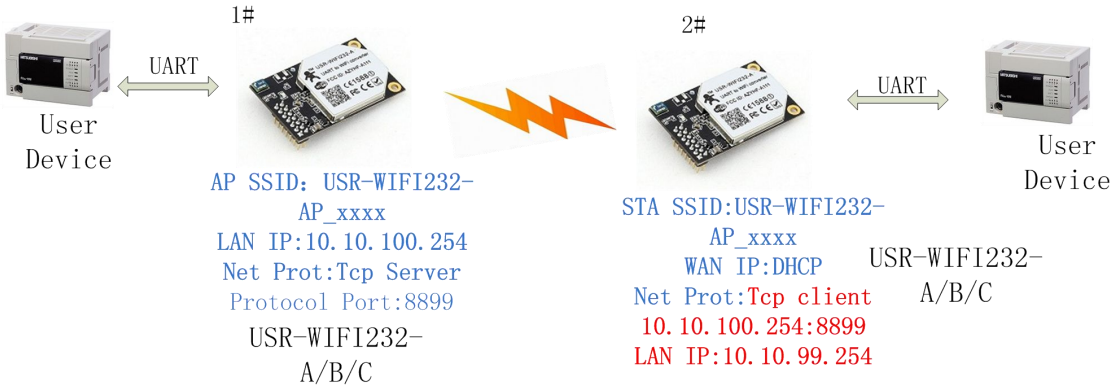



Figure 52 **Transparent Serial Port Application**

For left side USR-WIFI232-A/B/C module, configured as AP mode and use default SSID and IP address, network protocol configured as TCP/Server mode, and protocol port ID: 8899.

For right side USR-WIFI232-A/B/C module, configured as STA mode and setting the same SSID （”USR-WIFI232-AP_xxxx” for this example） with left side USR-WIFI232-A/B/C module, enable DHCP network and network protocol configured as TCP/Client mode, protocol port ID: 8899. Target IP address part setting the same IP address with left side USR-WIFI232-A/B/C module (“10.10.100.254” for this example).

When right side USR-WIFI232-A/B/C boot up, it will find wireless AP (SSID：USR-WIFI232-AP_xxxx for this example) and open TCP/Client network protocol to connect with left side module’s TCP/Server. All these operation will be automatic and after finished, the two user devices connected to USR-WIFI232-A/B/C module through serial port can communicate each other and think the connection between them is fully transparent.

**Note: LAN IP address and WAN port should in different segment, as picture shown, we change to 10.10.99.254 (the address get from left module WAN port DHCP is 10.10.100.xxx)**

## 6.2.4 Wireless Data Acquisition Card Application

For this wireless data acquisition card application, one PC works as data server and every data acquisition card connects with a USR-WIFI232-A/B/C module to support wireless connection function.

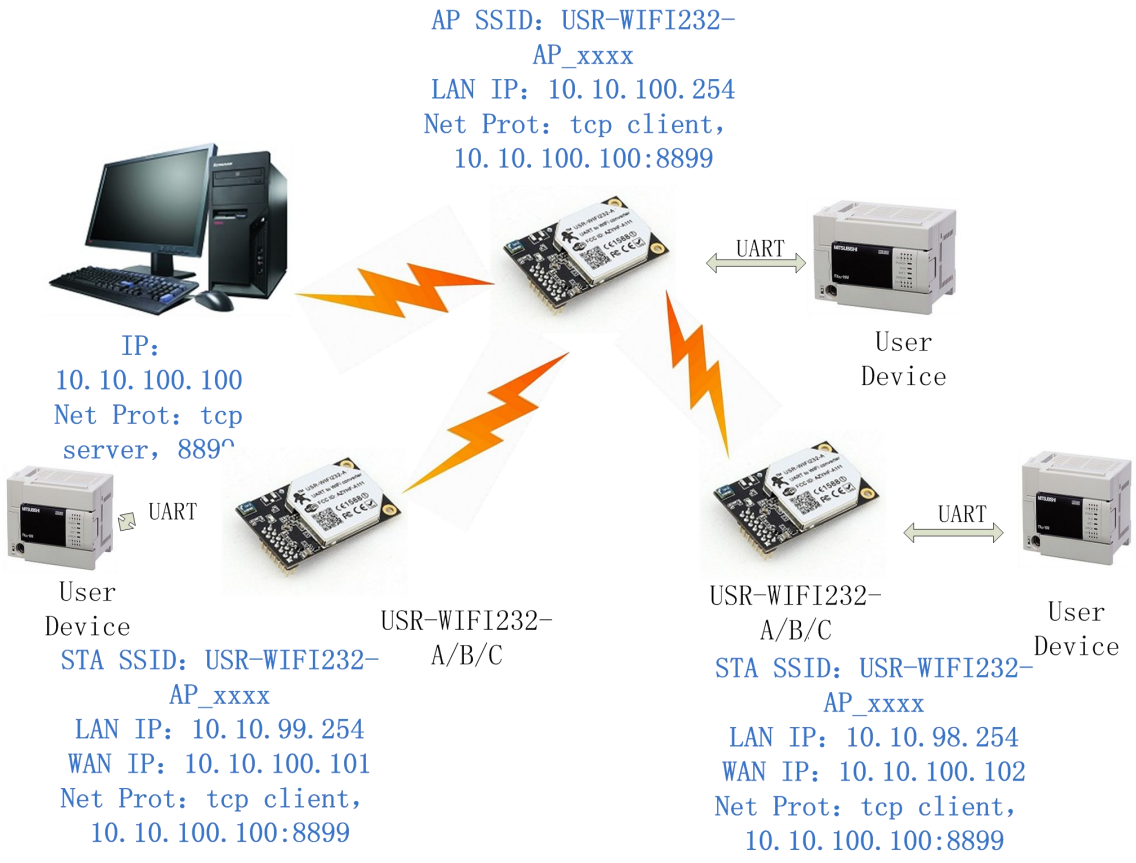



Figure 53 **Wireless Data Acquisition Card Application**

As above figure, one USR-WIFI232-A/B/C configured as AP mode and all others configured as STA mode. All USR-WIFI232-A/B/C which configured as STA and data server PC wireless connected to USR-WIFI232-A/B/C which configured as AP to make up a wires network.

Data server PC open TCP/Server protocol and all USR-WIFI232-A/B/C modules open TCP/Client protocol. All data acquisition cards' data and sampling information can be transmitted to data server PC for operation.

# Appendix A: Questions and Answers

## Q1: How to configure transparent serial port application (TCP protocol) with two WIFI modules?

- Network structure as below figure:
  - Module 1# Setting:
    - Works as AP mode; *--See "Mode Selection Page"*
    - LAN IP address: 10.10.100.254; *--See "AP Interface Setting Page"*
    - Network Protocal:TCP/Server, Port ID: 8899; *-- See "Application Setting Page"* (Module default setting);
  - Module 2# Setting:
    - Works as STA mode; --See "Mode Selection Page"
    - WAN connection type: DHCP or Static IP (For this example:10.10.100.100) *--See "STA Interface Setting Page"*
    - Network Protocal:TCP/Client, Port ID: 8899; Application IP address: Module 1#'s LAN IP address (10.10.100.254); *-- See "Application Setting Page"*
    - **Notes:** When module 2# works as STA mode, module's WiFi interface works as WAN port. Module's WAN IP address and LAN IP address shall be setting different segment. So, module 2#'s LAN IP address must change to other segment; (For this sample, we change to 10.10.99.254); *--See "AP Interface Setting Page"*

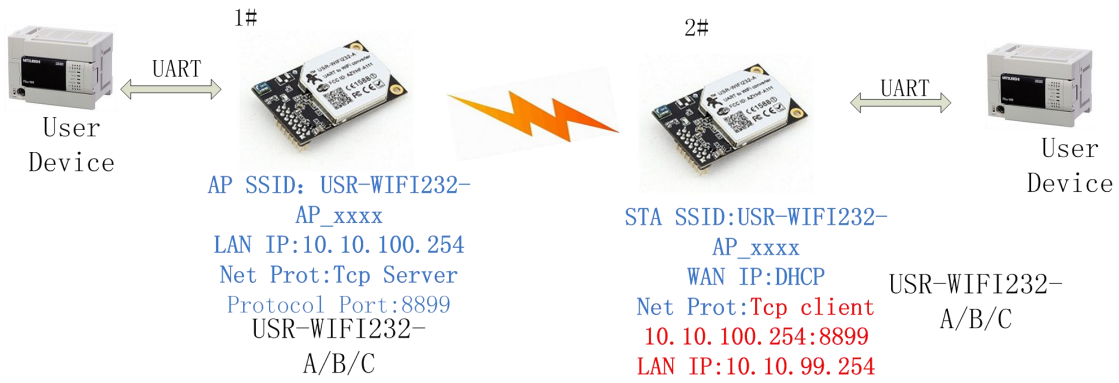



Figure 54 **Configure Transparent Serial Port Connection (TCP)**

## Q2: Where to Set WIFI Module LAN IP and WAN IP through Web Page?

- USR-WIFI232-A/B/C Wireless LAN IP address setting see “AP Interface Setting Page” as below Figure,

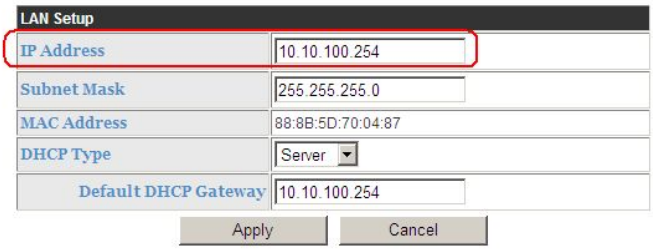



Figure 55 **Module LAN IP Setting**

- USR-WIFI232-A/B/C Wireless WAN IP address setting see “STA Interface Setting Page” as below Figure, User can set WAN connection type to DHCP and STATIC IP.

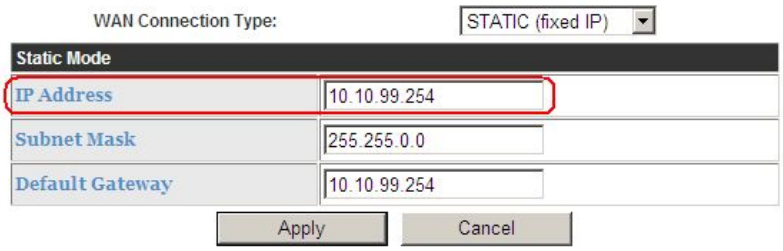



Figure 56 **Module WAN IP Setting**

## Q3: How to configure transparent serial port application (UDP protocol) with two WIFI modules?

- Network structure as below figure:
  - Module 1# Setting:
    - Works as AP mode; *--See “Mode Selection Page”*
    - LAN IP address: 10.10.100.254; *--See “AP Interface Setting Page”*
    - Network Protocal:UDP, Port ID: 8899; Application IP address:10.10.100.100; *-- See “Application Setting Page”*
  - Module 2# Setting:
    - Works as STA mode; --See “Mode Selection Page”
    - WAN connection type: Static IP (10.10.100.100) *--See “STA Interface Setting Page”*
    - Network Protocal:UDP, Port ID: 8899; Application IP address: Module 1#’s LAN IP address (10.10.100.254); *-- See “Application Setting Page”*
    - LAN IP address: 10.10.99.254 (Different net segment with WAN port)

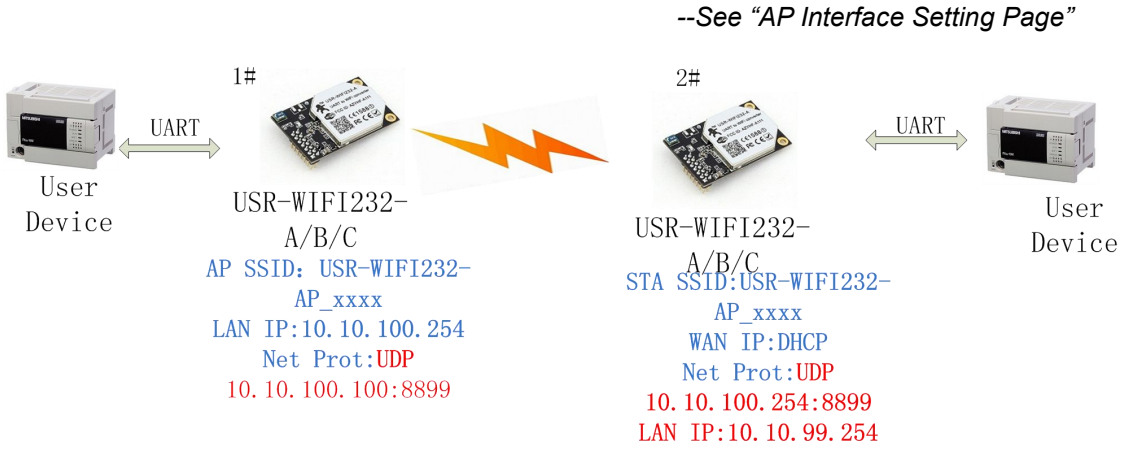



Figure 57 **Configure Transparent Serial Port Connection (UDP)**

## Q4: Where to set USR-WIFI232-A/B/C module network protocol (TCP/UDP)?

- USR-WIFI232-A/B/C network protocol setting see “Application Setting Page” as below Figure,
  - Protocol: TCP Server
    - Only Port ID required: 8899 (Default)

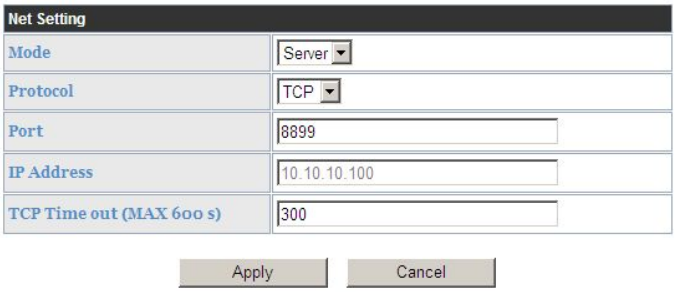



Figure 58 **Module Network Protocols: TCP/Server**

  - Protocol: TCP Client
    - Application IP address required: it’s target TCP server ‘s IP address;
    - Port ID required: 8899 (Default)

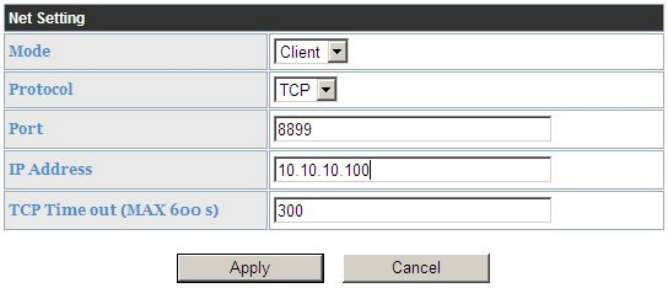



Figure 59 **Module Network Protocol: TCP/Client**

- Protocol: UDP
  - ✧ No Server/Client selection required;
  - ✧ Application IP address required: it's target device 's IP address;
  - ✧ Port ID required: 8899 (Default)

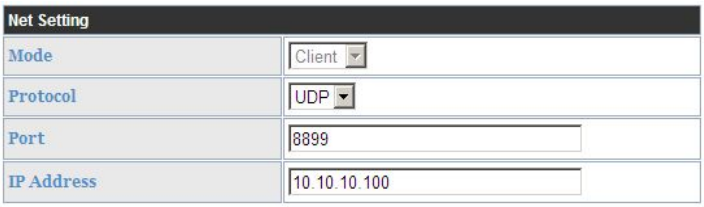



Figure 60 **Module Network Protocol: UDP**

## Q5: How to configure transparent serial port application: Two WIFI modules all configured as STA and connection through AP?

➢ Network structure as below figure:

- Module 1# Setting: ( We use USR-WIFI232-A/B/C as AP for this example)
  - ✧ Works as AP mode and all default setting;
- Module 2# Setting:
  - ✧ Works as STA mode; --See "Mode Selection Page"
  - ✧ WAN connection type: Static IP: 10.10.100.100; *--See "STA Interface Setting Page"*
  - ✧ Network Protocal:TCP/Server, Port ID: 8899; *-- See "Application Setting Page"*
  - ✧ LAN IP address: 10.10.99.254 (Different net segment with WAN port); *--See "AP Interface Setting Page"*
- Module 3# Setting:
  - ✧ Works as STA mode; --See "Mode Selection Page"
  - ✧ WAN connection type: Static IP: 10.10.100.101; *--See "STA Interface Setting Page"*
  - ✧ Network Protocal:TCP/Client, Port ID: 8899; Application IP address: Module 2#'s WAN IP address (10.10.100.100); *-- See "Application Setting Page"*
  - ✧ LAN IP address: 10.10.98.254 (Different net segment with WAN port); *--See "AP Interface Setting Page"*

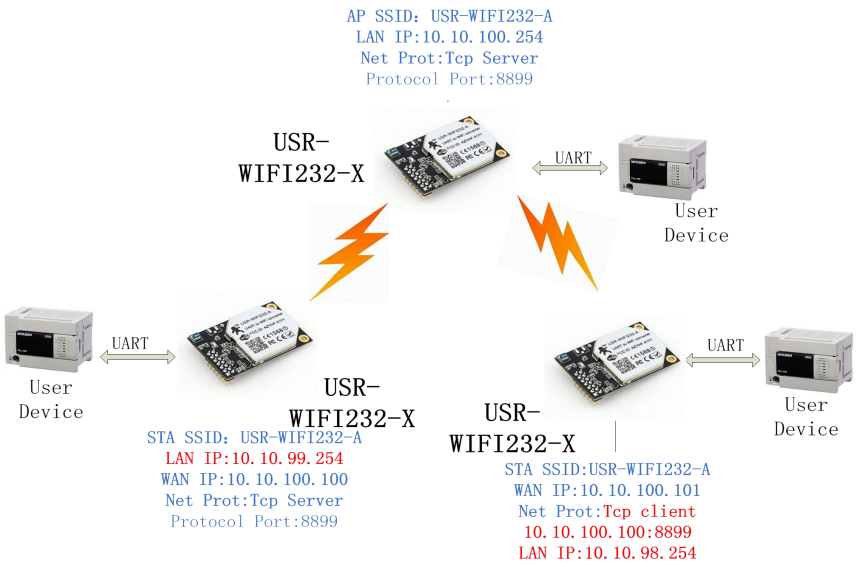



Figure 61 **Two USR-WIFI232-A/B/C Modules Connection Through AP**

## Q6: How to avoid IP address confliction when apply USR-WIFI232-A/B/C module?

- The following address allocation method can avoid the IP address confliction for dynamic and static IP address mixed application.
  - Module dynamic IP address range from 100 to 200 for last IP address segment.
    - Such as default IP: 10.10.100.254. When module works as AP, the IP address module can allocate to STA is from 10.10.100.100 to 10.10.100.200;
  - So, if user needs to set static IP for dedicated STA internal network, the available IP address range can start from 10.10.100.1 to 10.10.100.99.

## Q7: PC works as server, all WIFI modules works as data acquisition card and connect with PC, how to configure this application?

- Network structure as below figure: Three USR-WIFI232-A/B/C module setup 3 TCP links with PC server. Module 1# works as AP and all devices connect to module 1# through WiFi interface;
  - PC Setting:
    - IP address: 10.10.100.100;
    - Network Protocal:TCP/Server, Port ID: 8899;
  - Module 1# Setting:
    - Works as AP mode;
    - LAN IP address: 10.10.100.254;
    - Network Protocal:TCP/Client, Port ID: 8899; Application IP address:10.10.100.100;
  - Module 2# Setting:
    - Works as STA mode;

- ✧ WAN connection type: Static IP: 10.10.100.101;
- ✧ Network Protocal:TCP/Client, Port ID: 8899; Application IP address:10.10.100.100;
- ✧ LAN IP address: 10.10.99.254 (Different net segment with WAN port);

■ Module 3# Setting:

- ✧ Works as STA mode;
- ✧ WAN connection type: Static IP: 10.10.100.102;
- ✧ Network Protocal:TCP/Client, Port ID: 8899; Application IP address:10.10.100.100;
- ✧ LAN IP address: 10.10.98.254 (Different net segment with WAN port);

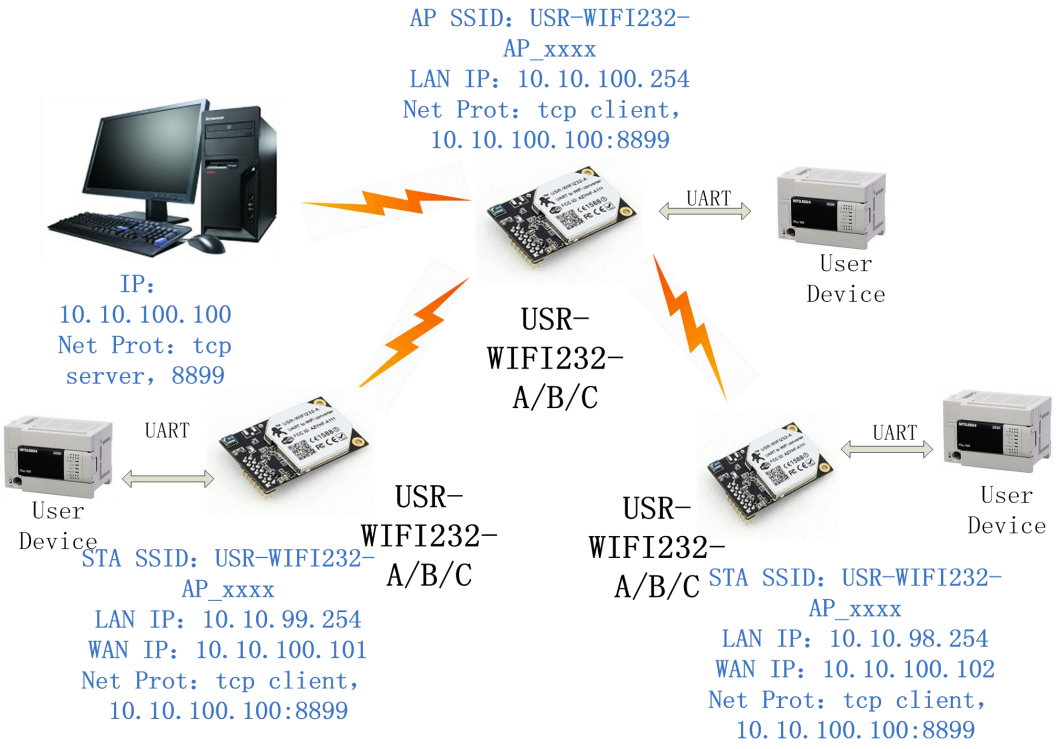



Figure 62 **Wireless Data Acquisition Card Setting**

## Q8: WIFI module support UDP multicast?

At present, all the WIFI module does not support UDP multicast function,IP multicast address range is "224.0.0.0~ 239.255.255.255",When setting module, please don't set this IP section, if set, may cause the module can't normal start.

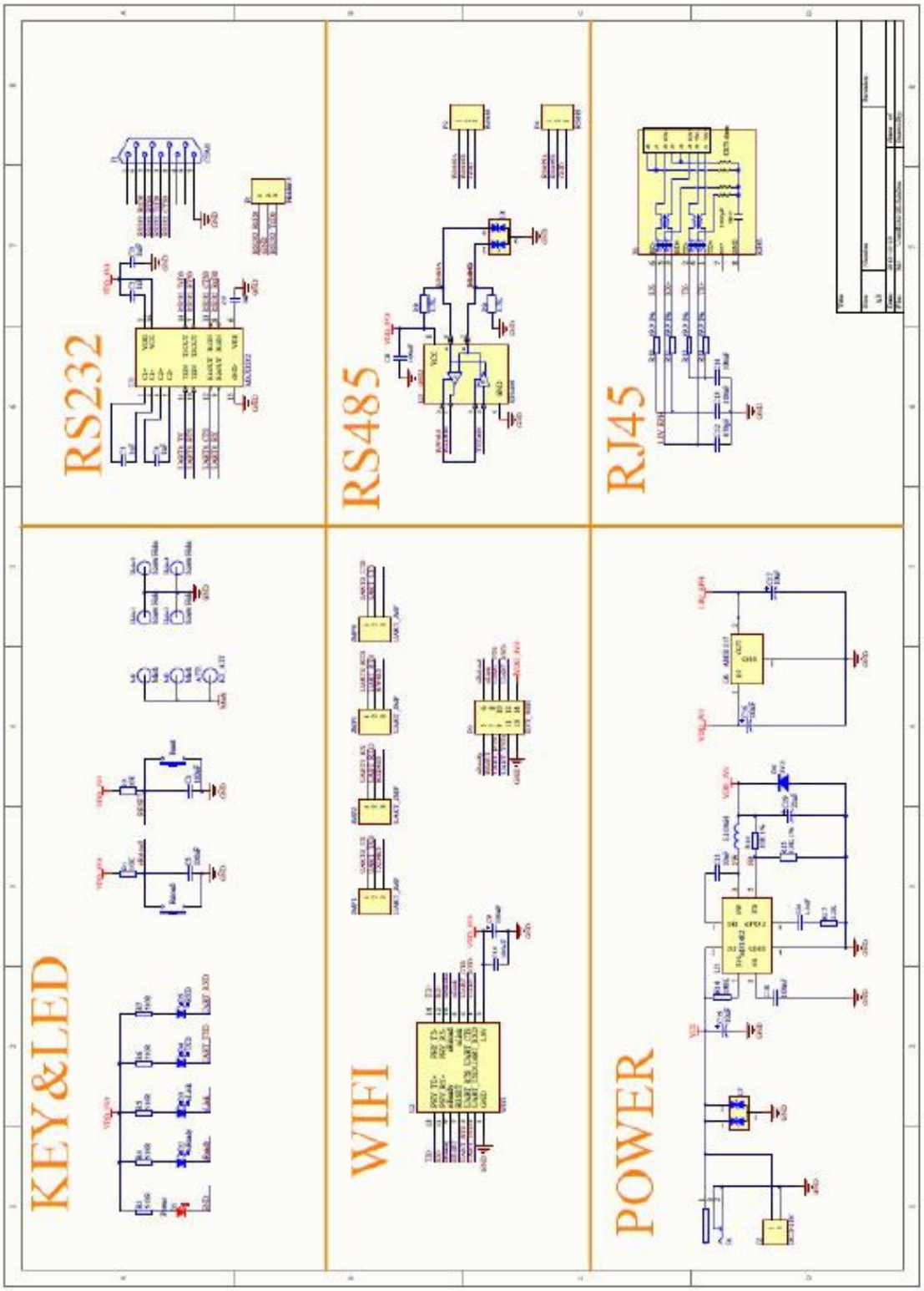
## Q9:WIFI module operates in STA mode, the PC how to get the IP module?

All wifi module supports UDP search,they will return to their respective IP, MAC, MID, detailed search process is as follows:

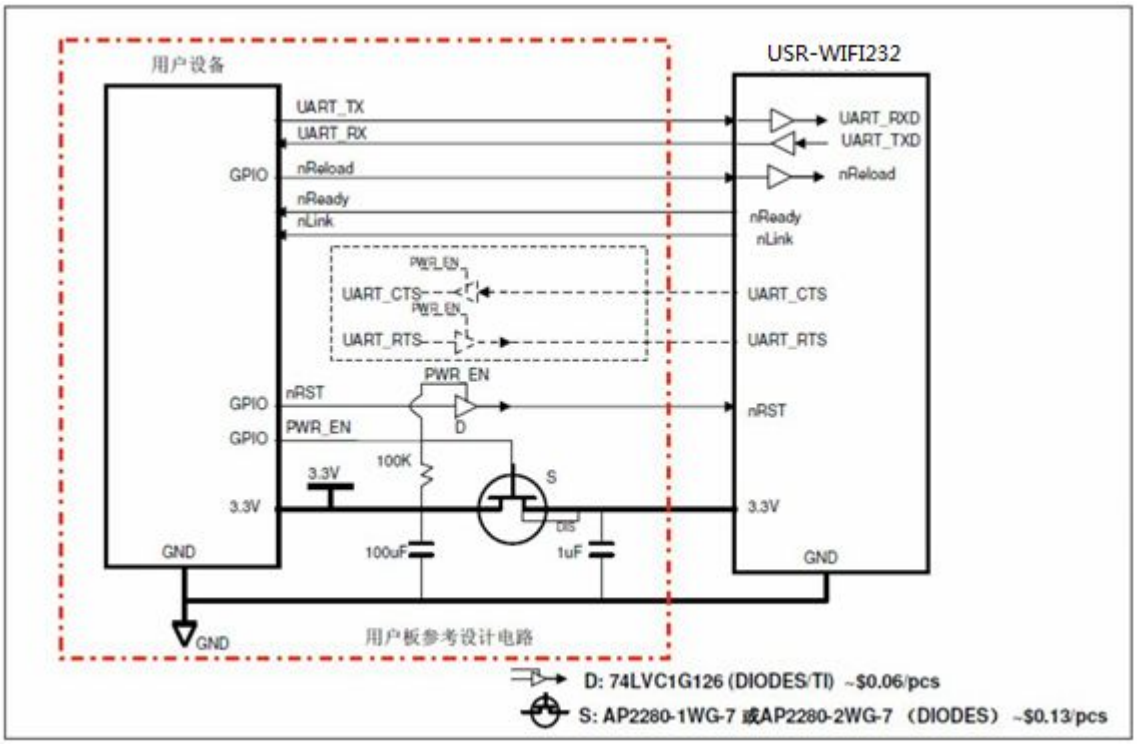
1. PC via UDP broadcast (broadcast address: xx.xx.xx.255, Port: 48899) sent a password, the default password is: "HF-A11ASSISTHREAD", the password can be used AT commands (AT + FASWD) set up,it's Up to 100 bytes.
2. After the module receives a password, if the password is correct, to the address (Unicast, Port: 48899) sends local IP address and MAC address and name of the module. (IP, MAC, MID as 10.10.100.254,888 B5D0000E2, guxin).

So you can get to the IP address of the module.

# Appendix b: evb reference design



# Appendix c: external power shutdown mode reference design



# Appendix e: Contact Information

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**Contact us:**

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Email: sales@usr.cn, order@usr.cn

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# Appendix f: Disclaimer

**This document provides information about USR-WIFI232-A/B/C modules, this document does not grant any license to intellectual property rights. Except the responsibility declared in the product sale clause, USR does not assume any other responsibilities. In addition, USR does not make any warranties for the sale and use of this product, including the suitability of the product for a particular purpose, merchantability or fitness for any patent, copyright or other intellectual property infringement, etc. USR may make changes to specifications and product descriptions without notice.**

# Appendix g: History

Ed.V3.1 Created on 1-14-2012.
Ed.V4.0 Update AT command information on 6-25-2012.
Ed.V4.1 Update 2.1.3 AT+STA function using notes and related commands
Add built-in antenna 1.2.3
Update Appendix B,C on 10-15--2012
Ed.V4.2 Update EVB reference design and picture
Ed.V4.3 Update on 12-01
Remove Agreement transmission function
Remove WDS function support
Add AT command AT+DOMAIN, AT+FRLDEN, AT+DHCPDEN, AT+HIDESSID
Ed.V4.5 Update on 14-04
Add TCP password authentication
Add Upload ID
Add Self-adaption Baudrate
Add WEB-IO

# END OF DOCUMENT